

AD A072061

AMRL-TR-79-62



HELMET-MOUNTED DISPLAYS: A COMPUTER-ASSISTED
ANALYSIS OF DAY-NIGHT VISUAL REQUIREMENTS

B.J. COHEN

Honeywell Systems and Research Center
2700 Ridgway Parkway
Minneapolis, Minnesota 55413

JULY 1979

Approved for public release; distribution unlimited

AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

79 07 31 046

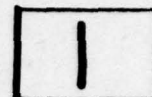
DDC ACCESSION NUMBER



DATA SHEET

PHOTOGRAPH

THIS SHEET



INVENTORY

AMRL-TR-79-62

DOCUMENT IDENTIFICATION

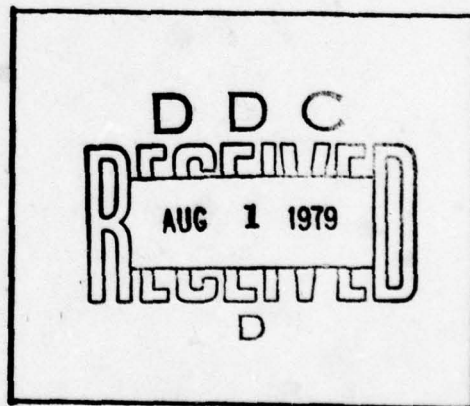
DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DDC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/ _____	
Availability Codes	
Dist	Avail and/or special
A	

DISTRIBUTION STAMP



DATE ACCESSIONED

79 07 31 046

DATE RECEIVED IN DDC

PHOTOGRAPH THIS COPY

NOTICES

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Please do not request copies of this report from Aerospace Medical Research Laboratory. Additional copies may be purchased from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with Defense Documentation Center should direct requests for copies of this report to:

Defense Documentation Center
Cameron Station
Alexandria, Virginia 22314

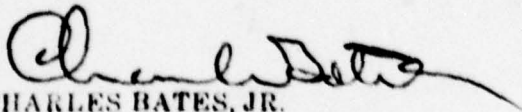
TECHNICAL REVIEW AND APPROVAL

AMRL-TR-79-62

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER



CHARLES BATES, JR.

Chief

Human Engineering Division

Aerospace Medical Research Laboratory

70 07 21 040

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AMRL-TR-79-62	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) HELMET-MOUNTED DISPLAYS: A COMPUTER-ASSISTED ANALYSIS OF DAY-NIGHT VISUAL REQUIREMENTS		5. TYPE OF REPORT & PERIOD COVERED Technical Report
		6. PERFORMING ORG. REPORT NUMBER 2079-SR5
7. AUTHOR(s) B. J. Cohen		8. CONTRACT OR GRANT NUMBER(s) F33615-72-C-0420/PZ0002
9. PERFORMING ORGANIZATION NAME AND ADDRESS Honeywell Systems and Research Center 2700 Ridgway Parkway Minneapolis, Minnesota 55413		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 5973
11. CONTROLLING OFFICE NAME AND ADDRESS Aerospace Medical Research Laboratory, Aerospace Medical Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio 45433		12. REPORT DATE July 1979
		13. NUMBER OF PAGES 295
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

FOREWORD

Honeywell has conducted a computer-assisted analysis in order to predict the range of ambient luminance conditions under which Helmet Mounted Display (HMD) imagery can be usefully resolved by an observer. This report examines those variables relating to ambient luminance, display luminance, and the attenuation of each in terms of optimizing display contrast and minimizing differences in luminance to the two eyes.

Visual performance predictions were made based upon comparing the analytically-derived data with criteria values obtained from a limited number of technical reports. These criteria values were used even though it was recognized that the monocular see-through HMD is a unique system, thus limiting the applicability of data obtained from studies of related but still dissimilar systems such as head-up displays (HUDs) and occluded monocular HMDs.

Among the factors affecting the quality of the displayed imagery, those variables most crucial to display luminance and contrast were systematically varied on a computer. This was done to analytically determine those light attenuation-display luminance combinations that would yield the best visual performance across external luminances ranging from 1 foot-Lambert to 10,000 foot-Lamberts. The independent variables that were manipulated were:

- 1) V_x = Visor transmittance
- 2) L_D = Display luminance (at the observer's eye position)
- 3) B_x = Beamsplitter transmittance (that portion of the visor that reflects the CRT image back to the eye)

2

The study results are presented here in both figures and tables. Appendix A contains the raw data from the computer runs. The reader is cautioned to use the data presented herein for guidance only. Firm design decisions should be based upon the results of empirical studies conducted at the Honeywell Vision Research Laboratory. These will be published in a separate report.

ACKNOWLEDGEMENTS

The author wishes to thank Mr. Harry L. Task of the Performance Requirements Branch, Human Engineering Division, USAF Aerospace Medical Research Laboratory, at Wright-Patterson AFB, Ohio. Mr. Task initially encouraged this study in 1972 by his derivation of "maximum possible contrast" as applied to a see-through HMD. Thanks are extended also to Mr. Normal Planer of Honeywell who developed the computer program used to analyze the data and to Mrs. Esther McNulty and Miss Jean Erickson who plotted the graphs contained herein.

CONTENTS

	Page
SECTION I INTRODUCTION	1-1
Background	1-1
Statement of the Problem	1-2
SECTION II VARIABLES AFFECTING VISUAL PERFORMANCE	2-1
Independent Variables	2-1
Dependent Variables	2-4
Visual Performance Criteria	2-7
SECTION III METHOD	3-1
Test Conditions	3-1
Justification of Levels Evaluated	3-2
Predictions of Visual Performance	3-3
A Numerical Example	3-4
SECTION IV RESULTS	4-1
Calculations of Results	4-1
Curves of Expected Visual Performance	4-2
Acceptable Combination of Variables	4-21
SECTION V CONCLUSIONS AND RECOMMENDATIONS	5-1
SECTION VI REFERENCES	6-1
APPENDIX A COMPUTERIZED PREDICTIONS OF CONTRASTS AND INTEROCULAR LUMINANCE DIFFERENCE RATIOS	
APPENDIX B MAXIMUM POSSIBLE CONTRAST (C_{MAX}) AS A FUNCTION OF VISOR TRANSMITTED LIGHT (B_V) FOR VARIOUS VALUES OF DISPLAY LUMINANCE (L_D)	
APPENDIX C INTER-OCULAR LUMINANCE DIFFERENCE RATIO (B_A) AS A FUNCTION OF VISOR TRANSMITTED LIGHT (B_V) FOR VARIOUS VALUES OF DISPLAY LUMINANCE (L_D)	

ILLUSTRATIONS

Figure		Page
1	Block Diagram of Independent Variables Which Influence HMD Luminance and Contrast	2-2
2	C_{max} , When $L_D = 5$ Foot-Lamberts	4-3
3	C_{max} , When $L_D = 10$ Foot-Lamberts	4-4
4	C_{max} , When $L_D = 15$ Foot-Lamberts	4-5
5	C_{max} , When $L_D = 20$ Foot-Lamberts	4-6
6	C_{max} , When $L_D = 25$ Foot-Lamberts	4-7
7	C_{max} , When $L_D = 50$ Foot-Lamberts	4-8
8	C_{max} , When $L_D = 100$ Foot-Lamberts	4-9
9	C_{max} , When $L_D = 200$ Foot-Lamberts	4-10
10	C_{max} , When $L_D = 400$ Foot-Lamberts	4-11
11	B_Δ , When $L_D = 5$ Foot-Lamberts	4-12
12	B_Δ , When $L_D = 10$ Foot-Lamberts	4-13
13	B_Δ , When $L_D = 15$ Foot-Lamberts	4-14
14	B_Δ , When $L_D = 20$ Foot-Lamberts	4-15
15	B_Δ , When $L_D = 25$ Foot-Lamberts	4-16
16	B_Δ , When $L_D = 50$ Foot-Lamberts	4-17
17	B_Δ , When $L_D = 100$ Foot-Lamberts	4-18
18	B_Δ , When $L_D = 200$ Foot-Lamberts	4-19
19	B_Δ , When $L_D = 400$ Foot-Lamberts	4-20

TABLES

Table		Page
1	Representative Luminance Values	1-2
2	C_{\max} Requirements	2-8
3	Acceptable Performance Levels for a 13-Percent Transmittance Visor	4-22
4	Acceptable Performance Levels for a 25-Percent Transmittance Visor	4-23
5	Acceptable Performance Levels for a 50-Percent Transmittance Visor	4-24
6	Acceptable Performance Levels for a 100-Percent Transmittance Visor	4-25
7	Combinations of B_x , L_D , and V_x that Fulfill Criteria for Both C_{\max} and B	4-26

SECTION I INTRODUCTION

BACKGROUND

The Helmet Mounted Display (HMD) is a unique display system that projects a collimated cathode ray tube (CRT) image onto a partially reflective beamsplitter. While the HMD has been mechanized in a number of different configurations, the following characteristics are typical of recent "project-on-visor" displays and illustrate problems affecting all HMDs. The beamsplitter reflects approximately 90 percent of the display luminance projected to it, and also transmits approximately 7 percent of the light from the outside world so that the observer can see through the display. It is mechanized as a thin metallic film, vacuum-deposited over one eye on a helmet visor of uniform density which transmits approximately 14 percent of the external light to both eyes. Thus the two eyes are exposed to differing luminance levels.

A significant problem in the design of HMDs is the control of this interocular differential which varies as a function of ambient luminance, display luminance, visor transmittance, and beamsplitter reflectance/transmittance. These four variables, if properly optimized, will allow the observer to see his display against background luminance conditions ranging from 10,000 foot-Lamberts in bright sunlight at high altitudes, to cockpit lighting levels during night operations of 10 foot-Lamberts. Table 1 summarizes some representative luminance values which can be expected to occur in the operational environment of the airborne HMD.

This study provides data which have not been developed either analytically or empirically by previous investigators. Other studies of luminance and contrast requirements have been performed for Head-up Displays (Kelley *et al.*, 1965) and a limited investigation of HMD requirements was conducted

Table 1. Representative Luminance Values

<u>Condition</u>	<u>Luminance (Ft. -L.)</u>	<u>Reference</u>
"Average" CRT under night flying conditions	10	Webb, 1964
Average earth on a cloudy day	100	VanCott and Kinkade, 1972
Average sky 60° above horizon	600	Christensen, 1946
Average earth on a clear day	1000	VanCott and Kinkade, 1972
Average sky 30° above horizon	1250	Christensen, 1946
Representative luminance of clear sky	3000	Ketchel, 1967
Average sky at 15,000 feet	7000	Ibid. 1967
Average luminance above cloud level (30,000 feet)	10,000	Semple, <u>et al.</u> , 1971

(Jacobs et al., 1971). However, the present study represents the first systematic evaluation of 480 possible combinations of display luminance, background luminance, and light attenuation variables expressed in terms of anticipated visual performance. These predictions are intended to be used in conjunction with empirical results obtained from a study, conducted at the Honeywell Vision Research Laboratory, which has looked at the same variables under systematically controlled laboratory conditions. As HMD design concepts continue to evolve, we intend that the data provided herein and in the laboratory-based study will be used as guidelines in establishing optical system design criteria.

STATEMENT OF THE PROBLEM

The wide ranges of background luminance to which the operator is exposed produce a variety of problems unique to "see-through displays." High ambient

luminance tends to "wash out" the displayed imagery unless extensive filtering is used to improve the contrast between display and backgrounds. If the filtering reduces the transmission of the visor too much, the pilot is unable to see the outside world when ambient luminance is reduced. For example, if a pilot were flying above white clouds into the sun at high altitudes (10,000 foot-Lamberts ambient luminance) and descended through the clouds into an overcast environment (1000 foot-Lamberts), ambient luminance would decrease by 90 percent, and if his HMD were incorrectly designed, he would essentially be flying blindfolded.

Another way to increase display contrast is to reduce beamsplitter transmission. If carried to the extreme, this approach occludes the view of the ambient scene by one eye. In this case four related problems occur:

- 1) The pilot sees different things with each eye
- 2) With high external luminance and low display luminance, the amount of light presented to the display eye is considerably less than that presented to the other eye. Although display contrast may be sufficient to allow the display to be seen, the non-display eye becomes dominant and the pilot may find it difficult (if not impossible) to fix his attention on the display. The effect is compounded by decreasing ambient luminance. As external luminance decreases, the inter-ocular luminance difference also decreases until the net luminance to the display eye is significantly higher than that to the non-display eye. The display eye becomes dominant and the observer may have difficulty in fixing his attention on the ambient scene.

- 3) Loss of external vision in the display eye combined with structural obstructions in cockpit can dangerously reduce the pilot's view of the world. This is particularly true in the F106 where the longitudinal wind-screen baffle splits normal vision and thus requires unobstructed vision for each eye separately.
- 4) A problem of particular difficulty to the helmet mounted display, which necessarily must use very small cathode ray tubes, is the limited luminance available from these tubes. Where other see-through displays such as "HUDs", with fewer limitations on weight and volume, may be able to overpower the ambient brightness, the HMD must achieve readability by other means. The design of HMDs is thus more difficult than other types of displays.

SECTION II

VARIABLES AFFECTING VISUAL PERFORMANCE

INDEPENDENT VARIABLES

Under ideal conditions, we would like to maximize the contrast of the HMD-displayed imagery and at the same time deliver equal amounts of light energy to the two eyes. To do this we must recognize that the visor-transmitted light going to both eyes, and the CRT imagery going to the display eye must be modulated in some fashion in order to permit acceptable visual performance under a wide variety of background luminance conditions. Figure 1 represents the manner in which this modulation occurs. Here, ambient light, which can be expressed in terms of background luminance (L_B) reaches the observer's eyes by passing through the helmet visor. The visor, in turn, reduces the amount of incoming light by only transmitting a portion of the light. This attenuation is expressed in terms of visor transmittance (V_x). The resultant visor transmitted light (B_v) is equal to the product of (L_B)(V_x). Thus,

$$B_v = (L_B)(V_x). \quad (1)$$

The visor-transmitted light then goes to the non-display eye without further attenuation. The visor has a partially reflective, partially transmissive combining or "beamsplitter" surface in front of the display eye that further reduces the incoming light. This reduction is expressed in terms of beamsplitter transmittance (B_x). The net background luminance on the beamsplitter (B_B) is equal to the product of B_v and the visor transmitted light, that is,

$$B_B = (B_v)(B_x) \quad (2)$$

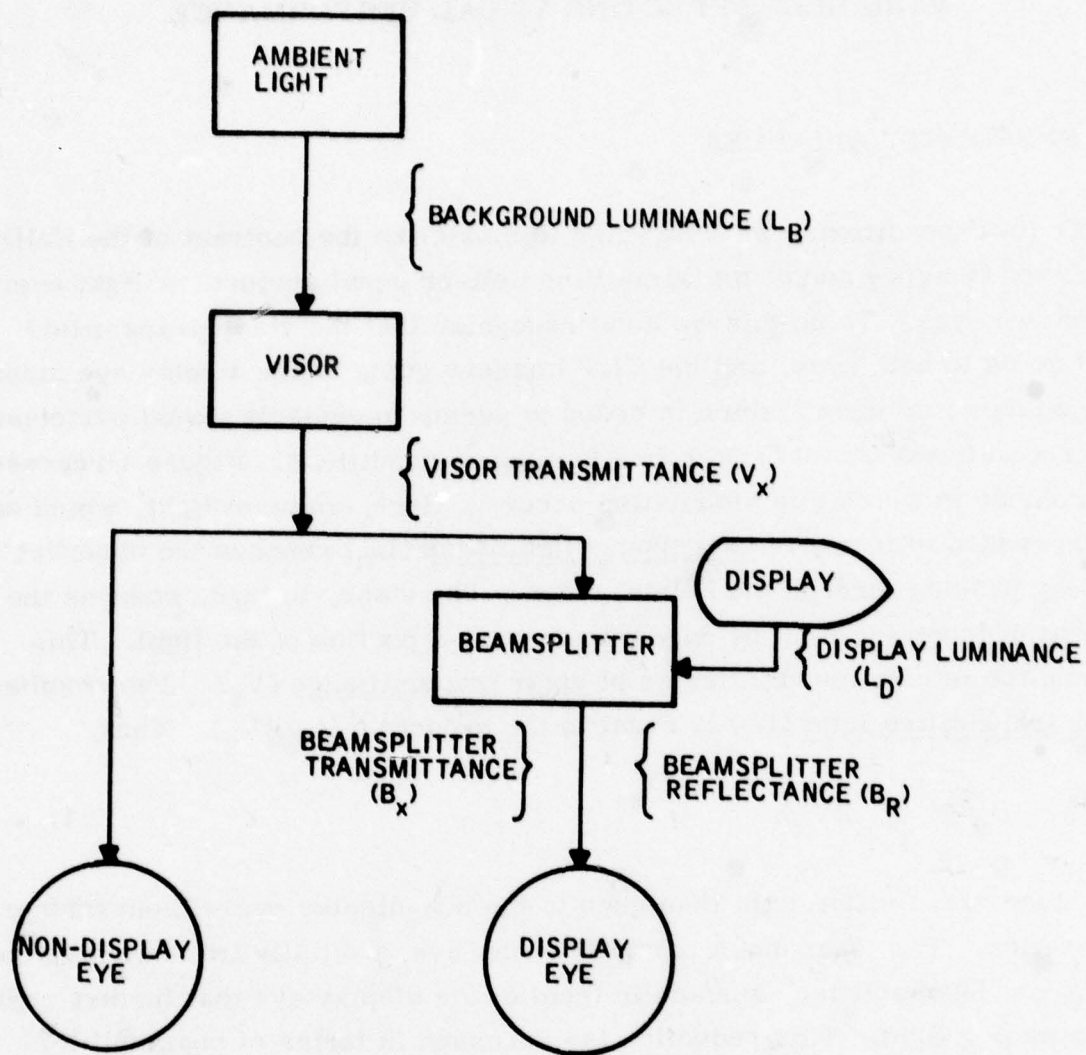


Figure 1. Block Diagram of Independent Variables Which Influence HMD Luminance and Contrast

The beamsplitter, in addition to reducing visor-transmitted light, also reflects the light projected to it from the face of the CRT display to the observer's display eye. The amount of display luminance (L_D) transmitted to the observer is a function of how much of the display energy is reflected from the posterior surface of the beamsplitter, how much is transmitted through the anterior surface of the beamsplitter, and how much is absorbed by the beamsplitter. It was assumed that absorption (which typically amounts to 1-2 percent) could be ignored to help simplify the present analysis. Since the sum of beamsplitter transmittance (B_x) and beamsplitter reflectance (B_R) was assumed to equal unity, i. e., $B_x + B_R = 1$, then it follows that:

$$B_R = 1 - B_x \quad (3)$$

Therefore, the net display luminance on the beamsplitter (B_D) is equal to the product of display luminance and beamsplitter reflectance, i. e.,

$$B_D = (L_D)(B_R) \quad (4)$$

Since the beamsplitter combines the visor-transmitted light and the display-transmitted light, Equation (4) only applies when no external light is transmitted through the beamsplitter. This represents the occluded monocular display where $B_x = 0$. The more general case addressed by the present study is that of the see-through monocular display where $B_x > 0$. In this case, total light energy transmitted to the display eye consists of the net background luminance on the beamsplitter (B_B) plus the display luminance reflected from the posterior surface of the beamsplitter, and:

$$B_D = (L_D)(B_R) + B_B \quad (5)$$

In summary then, there are four major independent variables that were systematically varied in the present study. They are:

- 1) Background luminance = L_B
- 2) Visor transmittance = V_x
- 3) Beamsplitter transmittance = B_x
- 4) Display luminance = L_D

These, in turn, are used to derive the following:

- 1) Visor-transmitted light = $B_v = (L_B)(V_x)$
- 2) Net Background luminance on the beamsplitter = $B_B = (B_v)(B_x)$
- 3) Beamsplitter reflectance = $B_R = 1 - B_x$
- 4) Net Display luminance on the beamsplitter = $B_D = (L_D)(B_R)$
where $B_x = 0$ and
- 5) $B_D = (L_D)(B_R) + B_B$ where $B_x > 0$

DEPENDENT VARIABLES

Given selected values of L_D , B_x , V_x , and L_B , Equations (1) through (5) were then used to predict human visual performance in terms of two major dependent variables, viz., Display Contrast, and Interocular Luminance Differences.

Contrast, which is an expression of the relative luminance of a figure with respect to the luminance of its background, is usually given in the form of a ratio. Typically, the two luminance values are independent so that the figure may be brighter or darker than its surround. There are a number of ways of expressing contrast, but the most common is to express it as the proportional increase in overall luminance contributed by the figure, i. e.,

$$\text{contrast} = \frac{L_{\text{figure}} - L_{\text{background}}}{L_{\text{background}}} \quad (6)$$

The resultant contrast, which is usually expressed as a percentage, can vary from 0 to 100 percent for figures darker than their backgrounds, and from 0 to ∞ for figures lighter than their backgrounds. Classical contrast studies, such as those of Blackwell (1946) and Carel (1965) have concentrated on this type of contrast expression. Another way of expressing contrast is in terms of contrast modulation which has been defined (Van Nes and Bouman, 1967) as

$$C = \frac{B_{\text{max}} - B_{\text{min}}}{B_{\text{max}} + B_{\text{min}}} \quad (7)$$

where B_{max} is the highest luminance value of the display and B_{min} is the lowest. Equation (7) is another way of expressing the ratio of the incremental change in luminance to the average luminance, i. e.,

$$C = \frac{\Delta L}{\bar{L}} \quad (8)$$

which is analogous to the familiar "Weber Fraction", $\frac{\Delta S}{S}$ (Kling and Riggs, 1971) used to psychophysically express the ratio of the minimal noticeable difference in stimulus intensity to the average stimulus intensity.

With a see-through display, the display luminance will always be greater than the background luminance so that using Equation (6), the contrast values obtained in the present study could take any value between zero and infinity. To make the data compatible with contrast values used in engineering specifications for CRT displays, however, it was decided that all contrast values in the present study should be expressed in terms of contrast modulation (Equation 7). It was also pointed out¹ that any Equation (6) contrast value (C_D) could be converted to modulation contrast (C_M) by the equation

¹H. L. Task, Private Communication, May 8, 1973.

$$C_D = \frac{2 C_M}{1 - C_M} \quad (9)$$

To derive contrast for the see-through HMD, it is necessary to know both the maximum and minimum luminances of the display that could be obtained given a fixed value of L_B , L_D , B_x , and V_x . Given these maximum and minimum luminances, the resulting contrast is now the maximum possible contrast (C_{max}). By definition, the maximum luminance would be transmitted when maximum net background luminance is combined with maximum display luminance on the inner (posterior) surface of the beamsplitter. Thus, maximum luminance would be equal to B_D . Minimum luminance, on the other hand would be the net background luminance alone, B_B , and

$$C_{max} = \frac{B_D - B_B}{B_D + B_B} \times 100^1 \quad (10)$$

Thus, for any combination of values assigned to the independent variables, it is now possible to compute C_{max} . This is precisely what was done in the present study.

The introduction to this report points out that display contrast was one of two considerations of critical importance to monocular see-through HMD design. The other important consideration is the net luminance finally transmitted to each eye. For any given combination of independent variables, the maximum luminance transmitted to the display eye is B_D , which is the sum of reflected display luminance and transmitted external luminance. On the other hand, for the same combination of independent variables, the maximum luminance transmitted to the non-display eye is B_v , which is the visor-transmitted light.

Various combinations of L_D , B_x , V_x , and L_B produce situations in which B_D and B_v are equal, or at least close enough in luminance for the observer not to feel an effect. Thus, if C_{max} is high enough for the observer to comfortably

¹ C_{max} is expressed as a % value.

see the display, and B_D is close to B_V , then we have a reasonably good visual environment, and optimum visual performance would be anticipated. On the other hand, if B_D and B_V differed greatly, even an ideal C_{max} value would not guarantee optimum visual performance. Presumably, differences in luminance would lead to such phenomena as "binocular rivalry" (Cohen and Markoff, 1972) where the observer's attention would alternate from one eye to the other and he would be unable to maintain constant attention with one eye. Similarly, if the interocular luminance difference were great enough, alternation would give way to "suppression" and the dimmer field of view would not be seen at all. Such a situation could be particularly bad in the air-to-air combat situation where a highly occluded and bright display might completely suppress a pilot's vision with his non-display eye and he would be essentially flying blind. The most convenient expression for the difference in luminance to the two eyes is the interocular luminance difference ratio (B_Δ) which is the ratio of B_D to B_V , i.e.,

$$B_\Delta = \frac{B_D}{B_V} \quad (11)$$

Thus when $B_\Delta = 1$, the two eyes would be receiving equal light energy. When $B_\Delta > 1$ more luminance would be transmitted to the display eye, and the reverse situation would occur when $B_\Delta < 1$.

VISUAL PERFORMANCE CRITERIA

A previous section of this report points out that there is a minimum value of C_{max} below which the display would be so degraded or "washed out" that effective visual performance could not be reliably obtained. Similarly, there are values of B_Δ which will produce unacceptable visual performance if exceeded. The determinations of acceptable levels of both C_{max} and B_Δ were done for the present study using the best data available from previous research. Unfortunately, the see-through monocular HMD is a unique system, and data directly applicable to it are almost non-existent.

Table 2 summarizes results from two studies of the Head-up Display (HUD). Since the HUD is a see-through display, many of the comments applicable to the HMD are applicable for the display eye only. Nevertheless, it was decided that the criterion of "comfortable viewing" established by Kelley, et al. (1965) would provide a conservative estimate of the acceptability of various combinations of the independent variables. Therefore, $C_{\max} = 23\%$ was chosen as the lower cutoff point for seeing an image projected on the beamsplitter against a background of beamsplitter-transmitted light.

Table 2. C_{\max} Requirements

<u>Criterion</u>	<u>Standard Combiner</u>	<u>Trichroic Combiner</u>
• Comfortable ¹ viewing	23%	6%
• 99% Threshold ² acuity (1 mil)	12%	--
• 90% Threshold ² acuity (1 mil)	9%	--
• 90% Threshold ¹ perception of pointer position	5%	2%

¹Kelley, Ketchel, and Strudwick, 1965

²Carel, 1965 (based on data from Blackwell, 1946)

Determining an acceptable set of upper and lower B_{Δ} limits was a bit more difficult. Ideally, $B_{\Delta} = 1.0$ would be a good criterion value against which to evaluate anticipated visual performance. However, $B_{\Delta} = 1$ occurs only under a few circumstances (e.g., $L_D = 25$ foot-Lamberts, $B_x = 4$ percent, $V_x = 25$

percent, and $L_B = 100$ foot-Lamberts). Therefore, it would be unrealistic to conclude that one and only one value of B_Δ would be acceptable, since no previous research has specifically addressed the problem of interocular differences in luminance with a monocular see-through HMD. The only study at all relevant was that of Jacobs *et al.*, (1971) who found "marked retinal rivalry effects" (pp. 62) with an occluded display with $L_D = 20$ foot-Lamberts and $L_B = 8000$ foot-Lamberts. Since they used an occluded, side-mounted display, $L_D = B_D$ and $L_B = B_V$, therefore $B_\Delta = \frac{L_D}{L_B} = \frac{20}{8000} = 0.0025$.

Based on this finding, it could be concluded that B_Δ was unacceptable if < 0.0025 , or if $B_\Delta > 400$ (i.e., $\frac{8000}{20}$). Jacobs *et al.*, (1971) found, however, that a 1 percent transmission filter over the non-display eye "allowed subjects to gain satisfactory information from the HMD (and) rivalry was considerably reduced -- " (pp. 62). What this finding meant to the present study was that a nominally "satisfactory" B_Δ had been found, namely $\frac{20}{(8000)(0.01)} = \frac{20}{80} = 0.25$ when $B_D < B_V$ and $80/20 = 4.00$ when $B_D > B_V$.*

This range of B_Δ values between 0.25 and 4.00 were chosen as the upper and lower cutoff points for an acceptable B_Δ ; but, it must be recognized that these values are based on some very broad assumptions. Hopefully, they represent conservative values so that the data in the present study will probably not result in a system that will induce binocular rivalry.

In summary, any combination of L_D , B_x , V_x , and L_B that results in a $C_{\max} < 23$ percent or a $0.25 > B_\Delta > 4.00$ would not be acceptable from the standpoint of visual performance.

*It has been assumed that the same degree of binocular rivalry would exist if the inputs were switched from one eye to the other.

SECTION III METHOD

TEST CONDITIONS

Section II of this report identified the following independent variables as crucial to visual performance with a see-through, monocular HMD:

- 1) L_B (background luminance)
- 2) L_D (display luminance)
- 3) V_x (visor transmittance)
- 4) B_x (beamsplitter transmittance)

Representative values (levels) of each independent variable were then selected and these levels were systematically varied against each other on a computer (SDS Model 9300) using the program shown in Appendix A. The levels used in the present study were as follows:

- 1) L_B : 10 foot-Lamberts, 100 foot-Lamberts, 1000 foot-Lamberts, and 10,000 foot-Lamberts (10^1 , 10^2 , 10^3 , and 10^4 foot-Lamberts).
- 2) L_D : 25 foot-Lamberts, 50 foot-Lamberts, 100 foot-Lamberts, 200 foot-Lamberts, and 400 foot-Lamberts.
- 3) V_x : 13 percent, 25 percent, 50 percent, and 100 percent ("Clear").
- 4) B_x : 2 percent, 4 percent, 8 percent, 25 percent, 50 percent, and 75 percent.

JUSTIFICATION OF LEVELS EVALUATED

The independent variables and their associated levels produced $4 \times 5 \times 4 \times 6 = 480$ possible combinations. The levels used were chosen for the following reasons:

- 1) The upper and lower L_B values represented the likely upper and lower background luminances against which the HMD would be used. The upper represented a 30,000-foot altitude above white clouds reflecting sunlight (Semple et al., 1971, pp. 448) and the lower represented average cockpit instrument luminance under low ambient illumination conditions (Webb, 1964, pp. 310). The intermediate values were chosen because of their exponential relationship to the end point values and the ease with which such values could be plotted on logarithmic graph paper.
- 2) The display luminance value of 400 foot-Lamberts was chosen because it is anticipated that such a tube brightness may someday become operational with a realistic tube life expectancy. The 25 foot-Lambert lower limit is also realistic because occluded displays presently use L_D s of approximately this magnitude (Jacobs et al., 1971, pp. 2). The intermediate values were chosen because of their direct linear relationship to the two limit values. Also, it should be pointed out that each value below 400 represents a 50 percent light loss which is the approximate magnitude of loss that occurs using a fiber optic bundle to transmit CRT imagery to the observer's eye.
- 3) The 13 percent V_x is representative of the "standard" Air Force visor which varies in transmittance between 12 percent and 15 percent. The "clear" (100 percent V_x) visor was chosen to evaluate maximum visor transmitted light. The intermediate

V_x values represent a doubling of each previous value for convenience in plotting the final results.

- 4) The 8 percent B_x has frequently been considered in conjunction with the 13 percent visor because it produces approximately 1 percent beamsplitter transmitted light. Evaluating such a combination is therefore very important. The other values of B_x were chosen so that a wide latitude of possible conditions could be explored.

PREDICTIONS OF VISUAL PERFORMANCE

C_{\max} and B_{Δ} were computed for each of the 480 combinations of the independent variables. Computations were based on Equations (10) and (11). The resultant estimates were then compared to the visual performance criteria, i.e.:

$$C_{\max} \geq 23\%$$

and

$$0.25 < B_{\Delta} < 4.00$$

Those values of L_D , V_x , and B_x that met the criteria for all levels of background luminance (L_B) were considered acceptable design parameters for the HMD.

A NUMERICAL EXAMPLE

Assume:

$$L_B = 10,000 \text{ foot-Lamberts}$$

$$L_D = 50 \text{ foot-Lamberts}$$

$$V_x = 50 \text{ percent}$$

$$B_x = 2 \text{ percent}$$

Solve for:

$$\underline{B_v} = (L_B)(V_x) = (10,000)(0.5) = \underline{5000 \text{ foot-Lamberts}} \text{ (Equation 1)}$$

$$\underline{B_B} = (B_v)(B_x) = (5000 \text{ foot-Lamberts})(0.02) = \underline{100 \text{ foot-Lamberts}} \text{ (Equation 2)}$$

$$\underline{B_R} = 1 - B_x = 1 - 0.02 = \underline{0.98} \text{ (Equation 3)}$$

$$\begin{aligned} B_D &= (L_D)(B_R) + B_B = (50 \text{ foot-Lamberts})(0.98) + 100 \text{ foot-Lamberts} \\ &= \underline{149 \text{ foot-Lamberts}} \text{ (Equation 5)} \end{aligned}$$

Then solve for:

$$\underline{C_{\max}} = \frac{B_D - B_B}{B_D + B_B} = \frac{49 \text{ foot-Lamberts}}{249 \text{ foot-Lamberts}} = 19.68 \text{ percent (Equation 10)}$$

and

$$B_{\Delta} = \frac{B_D}{B_v} = \frac{149 \text{ foot-Lamberts}}{5000 \text{ foot-Lamberts}} = 0.03 \text{ (Equation 11)}$$

The resultant $C_{\max} = 19.68$ percent falls below the minimum cutoff point for acceptable contrast, but only by a small amount so that the image could probably be seen, but at the expense of viewer comfort (see Table 2). On the other hand, B_{Δ} is far below the minimum acceptable cutoff of 0.25. In fact, the nondisplay eye would experience over 33 times as much light energy as the display eye.

Changing the levels slightly, e.g., increasing B_x from 2 percent to 25 percent results in an acceptable B_{Δ} (0.26) but an even more unacceptable C_{\max} of 1.48 percent. If, however, background luminance is reduced to 100 foot-Lamberts, then C_{\max} and B_{Δ} turn out to be a very acceptable 60 percent and 1.00, respectively. Thus, this combination of B_x , V_x , and L_D would produce acceptable visual performance, but not for the entire range of day-night luminance conditions the present study has addressed.

SECTION IV

RESULTS

CALCULATIONS OF RESULTS

Appendix A contains the printout of the computer run in which all levels of L_D , L_B , V_x , and B_x were varied. Examining these output data reveals a great deal of information about various combinations of the independent variables. For example, in addition to C_{max} and B_{Δ} , absolute contrast (C_{ABS}) and shades of Gray (SOG) have also been computed. The former is a contrast expression based on Equation (6) and produces values that can range from zero (no contrast between figure and background, i.e., $B_D = B_B$) to infinity (no background luminance transmitted, i.e., $B_B = 0$). "Shades of gray" is an expression of CRT brightness contrast used by the television industry. Levine *et al.* (1969) has defined a shade of gray as being $\sqrt{2}$ times brighter than the preceding brightness level and is related to C_{max} in that the number of shades of gray = $N+1$, where

$$N = \frac{\log_{10} (1+C_{max})^1}{\log_{10} \sqrt{2}} \quad (12)$$

C_{ABS} and SOG have been included in the analyses but have not, however, been employed in evaluating the various combinations of dependent variables, since it was felt that C_{max} and B_{Δ} provided a more understandable approach to predicting visual performance.

¹Personal communication, H. L. Task USAF (AMRL), December 1972.

CURVES OF EXPECTED VISUAL PERFORMANCE

Appendix A data were used to generate two types of curves:

- 1) C_{\max} as a function of B_v for all combinations of B_x and L_D . (See Figures 2 through 10.)
- 2) B_{Λ} as a function of B_v for all combinations of B_x and L_D . (See Figures 11 through 19.)

It should be noted that Figures 2 through 5 and 11 through 14 utilize display luminance (L_D) values of less than 25 foot-Lamberts. These values are valid, but were obtained during earlier computer runs. They have been included in the performance curves, however, to provide some additional basic data for the case of the relatively dim CRT.

To use these curves, two sets of loose transparent templates have been included with this report. One set is used to predict visual performance in terms of C_{\max} for L_B conditions ranging from 10 to 10,000 foot-Lamberts. The other set is used to predict visual performance in terms of B_{Λ} for the same range of L_B values. Each set consists of five templates, each template corresponding to a different visor transmittance (V_x).

To use the C_{\max} curves, select the C_{\max} template having the desired V_x printed on it. Select the set of C_{\max} curves (Figures 2 through 10) having the desired level of display luminance printed on it. Lay the template over the curves by carefully lining up the index marks with the side and bottom margins of the curves. Those curves (each corresponding to a different value of B_x) passing above and to the right of the upper of the two lines on the template define a B_x , V_x , L_D combination that will produce a "comfortable" level of C_{\max} for all levels of background luminance considered (i.e., 10^1 to 10^4 foot-Lamberts). Those passing above and to the right of the bottom line only, produce a display that can be seen, but not without observer discomfort.

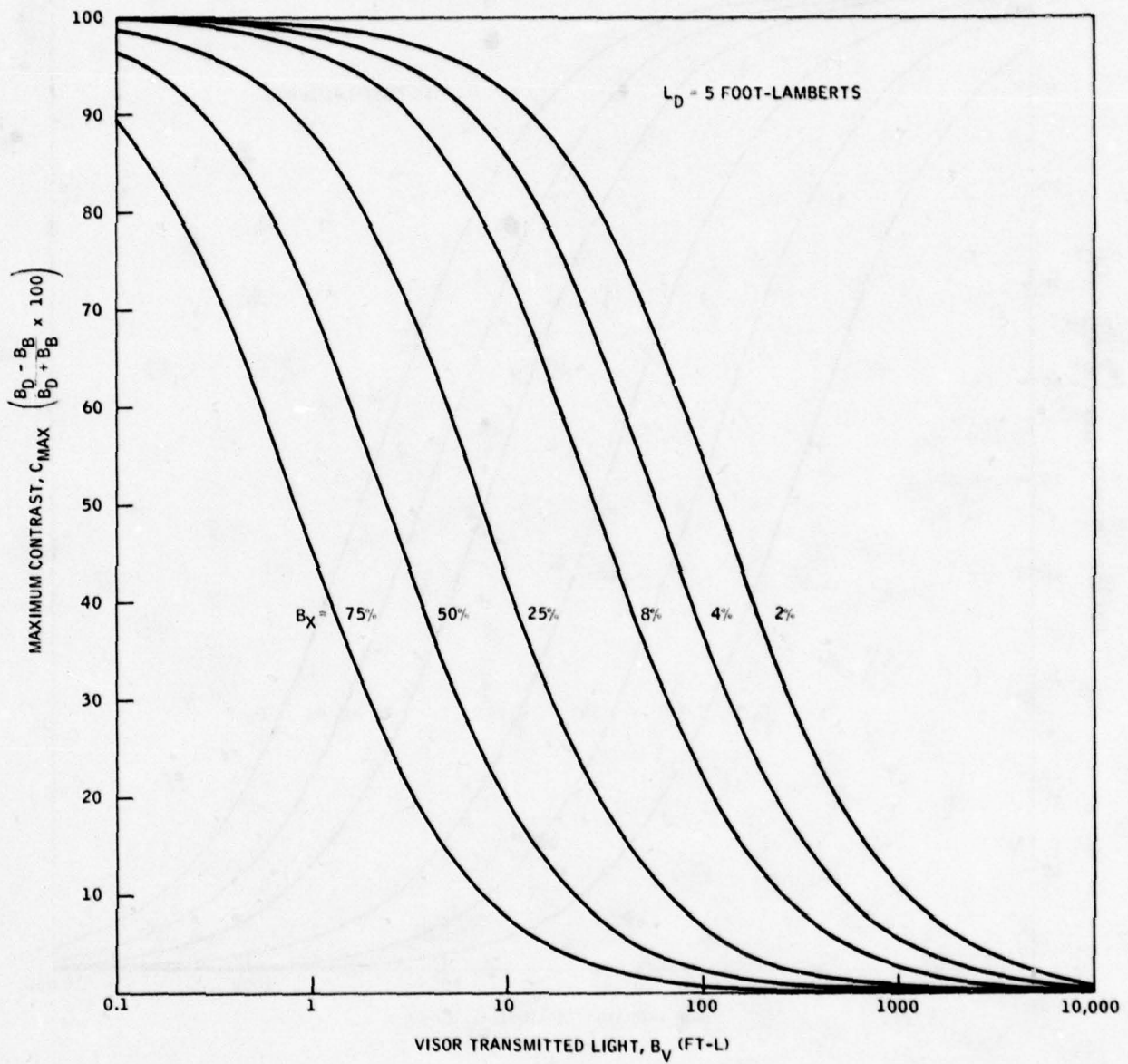


Figure 2. C_{max} , When $L_D = 5$ Foot-Lamberts

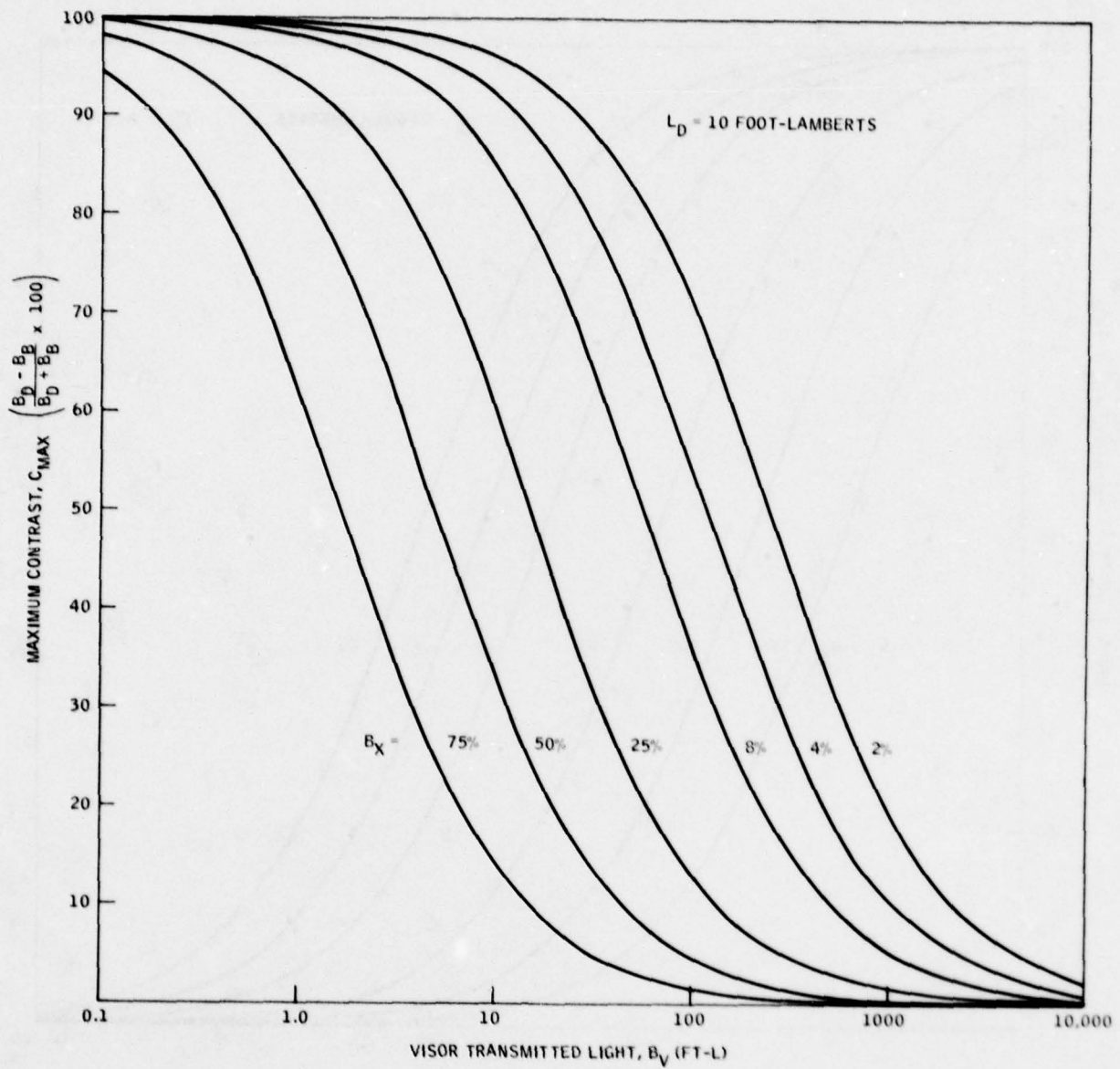


Figure 3. C_{max} , When $L_D = 10$ Foot-Lamberts

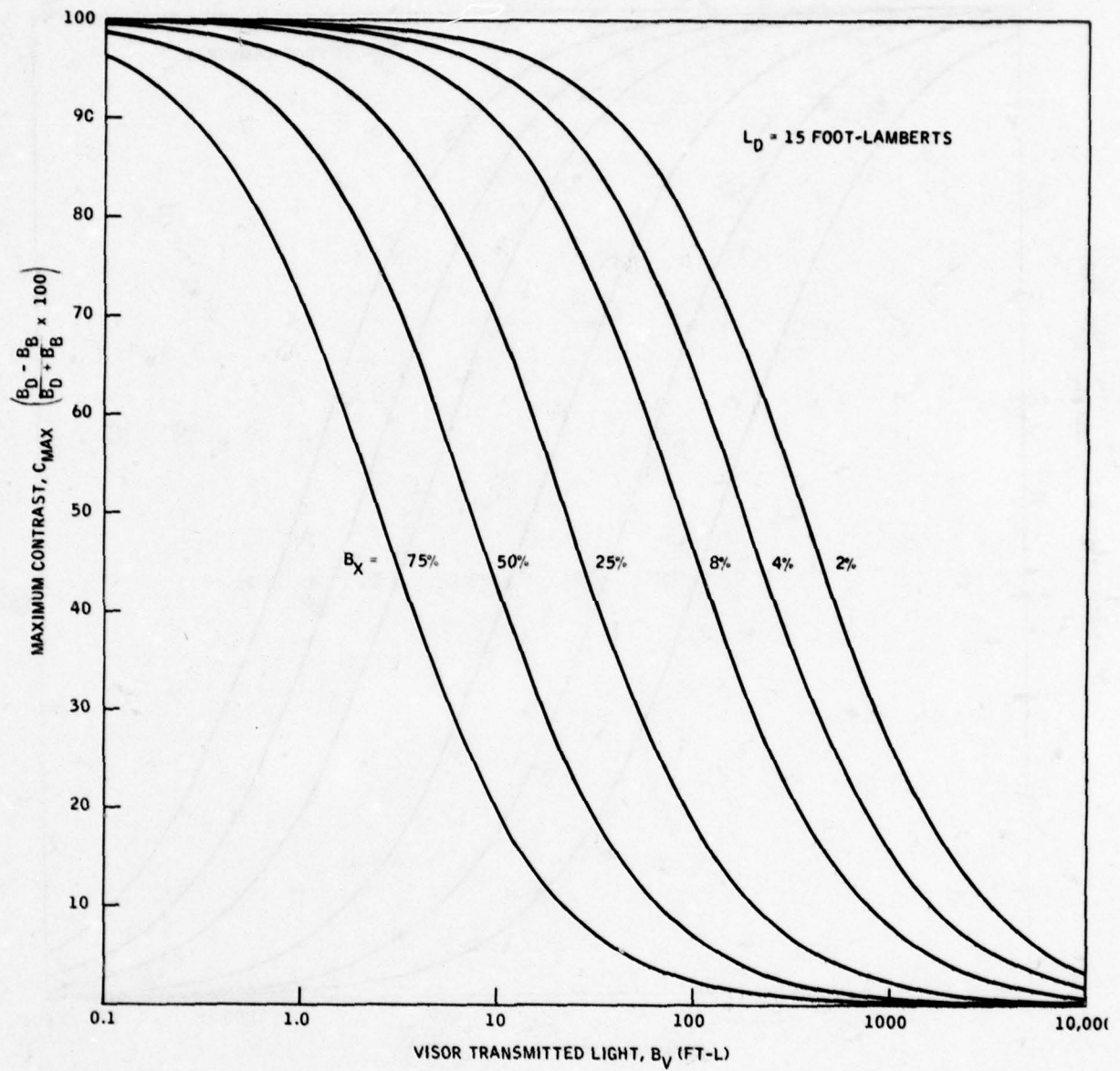


Figure 4. C_{max} , When $L_D = 15$ Foot-Lamberts

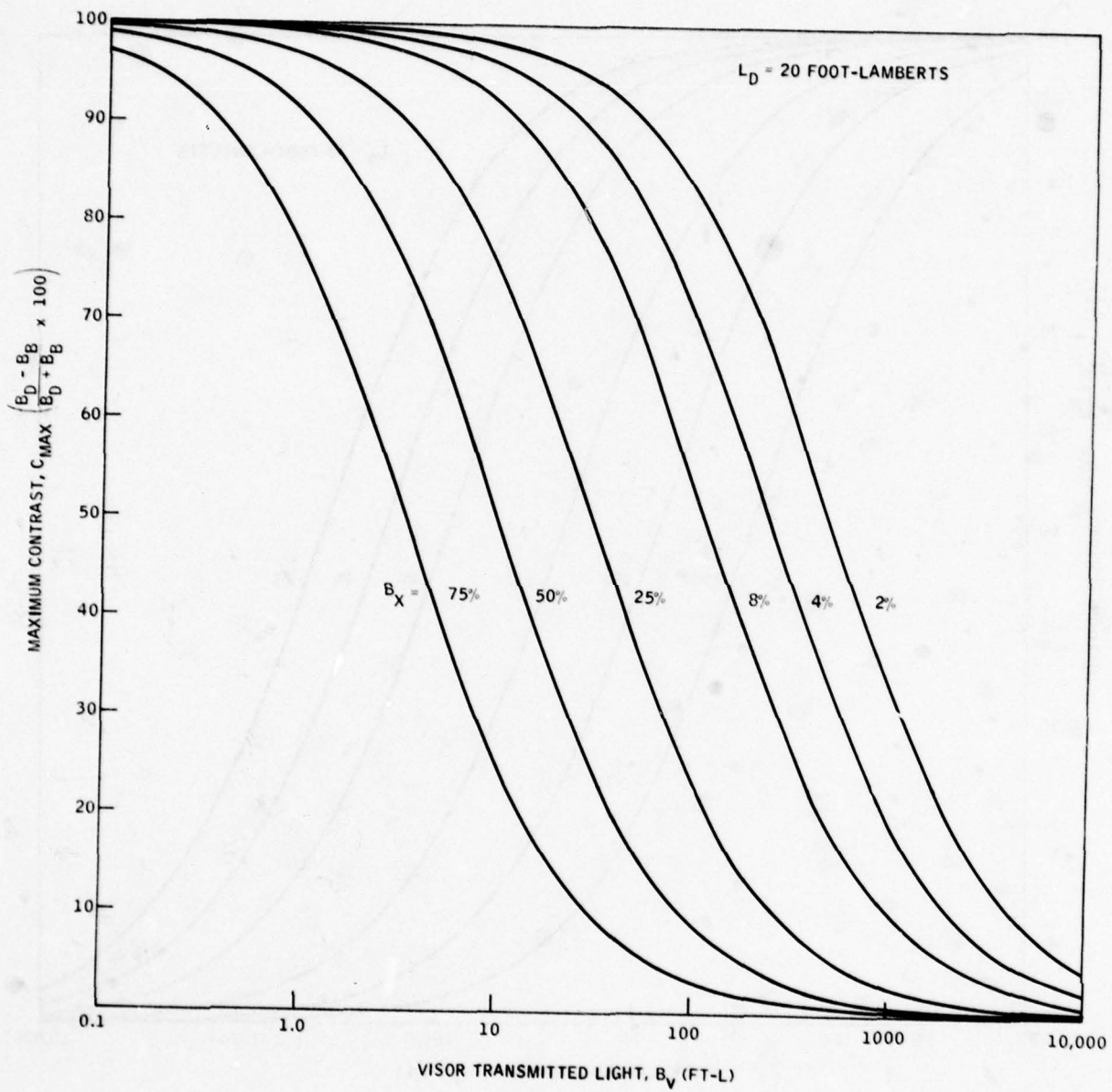


Figure 5. C_{\max} , When $L_D = 20$ Foot-Lamberts

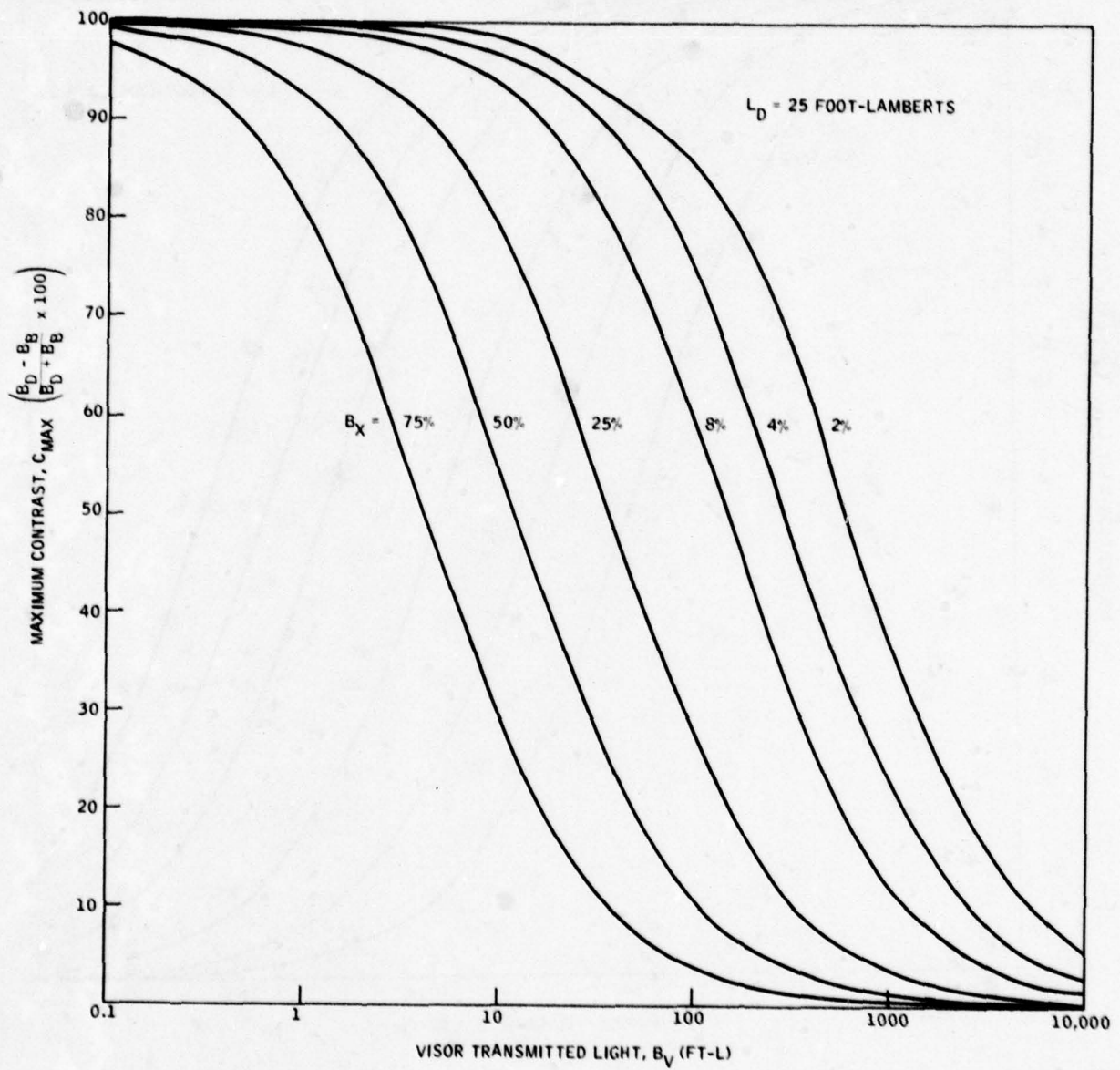


Figure 6. C_{\max} , When $L_D = 25$ Foot-Lamberts

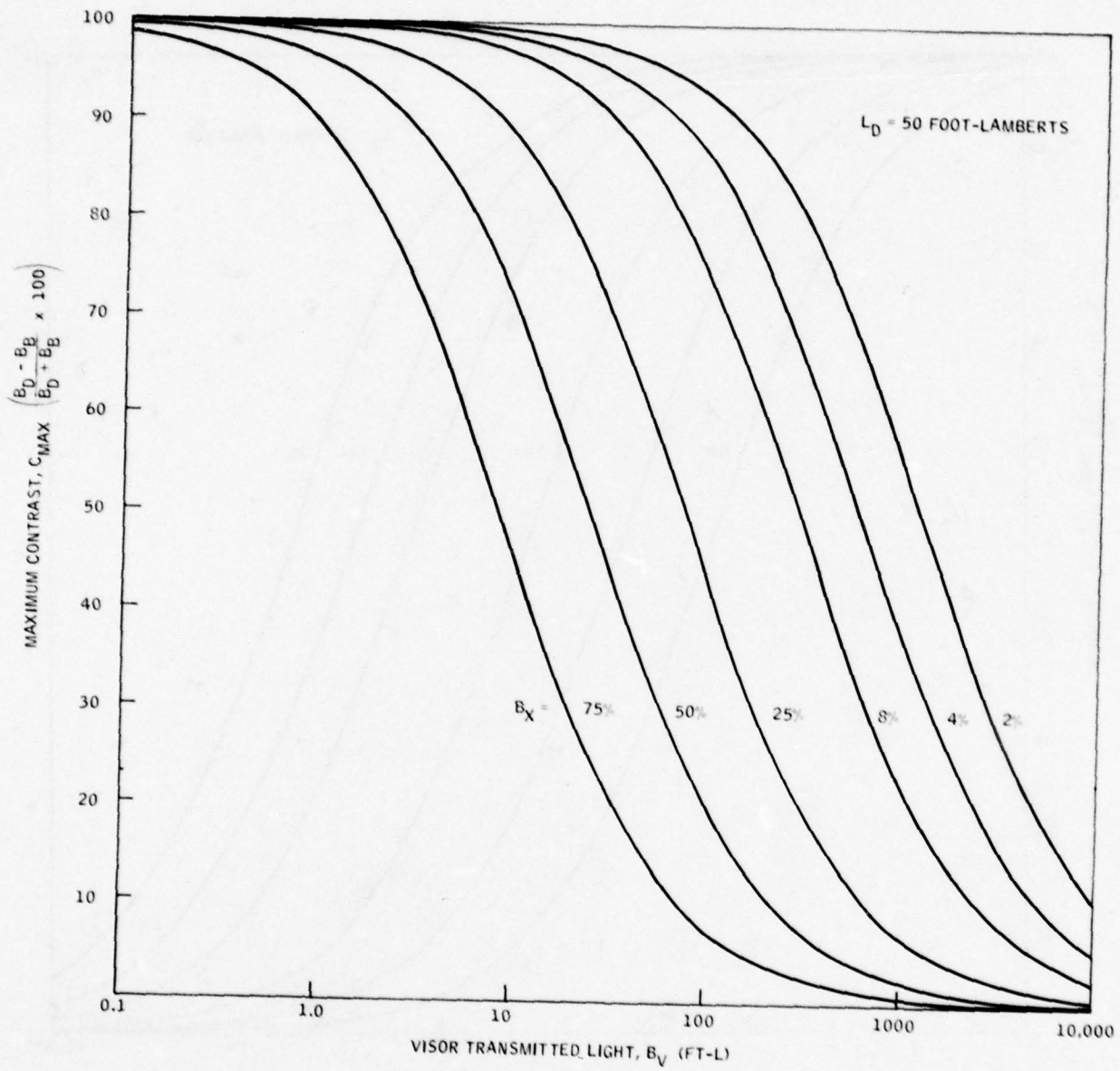


Figure 7. C_{max} , When $L_D = 50$ Foot-Lamberts

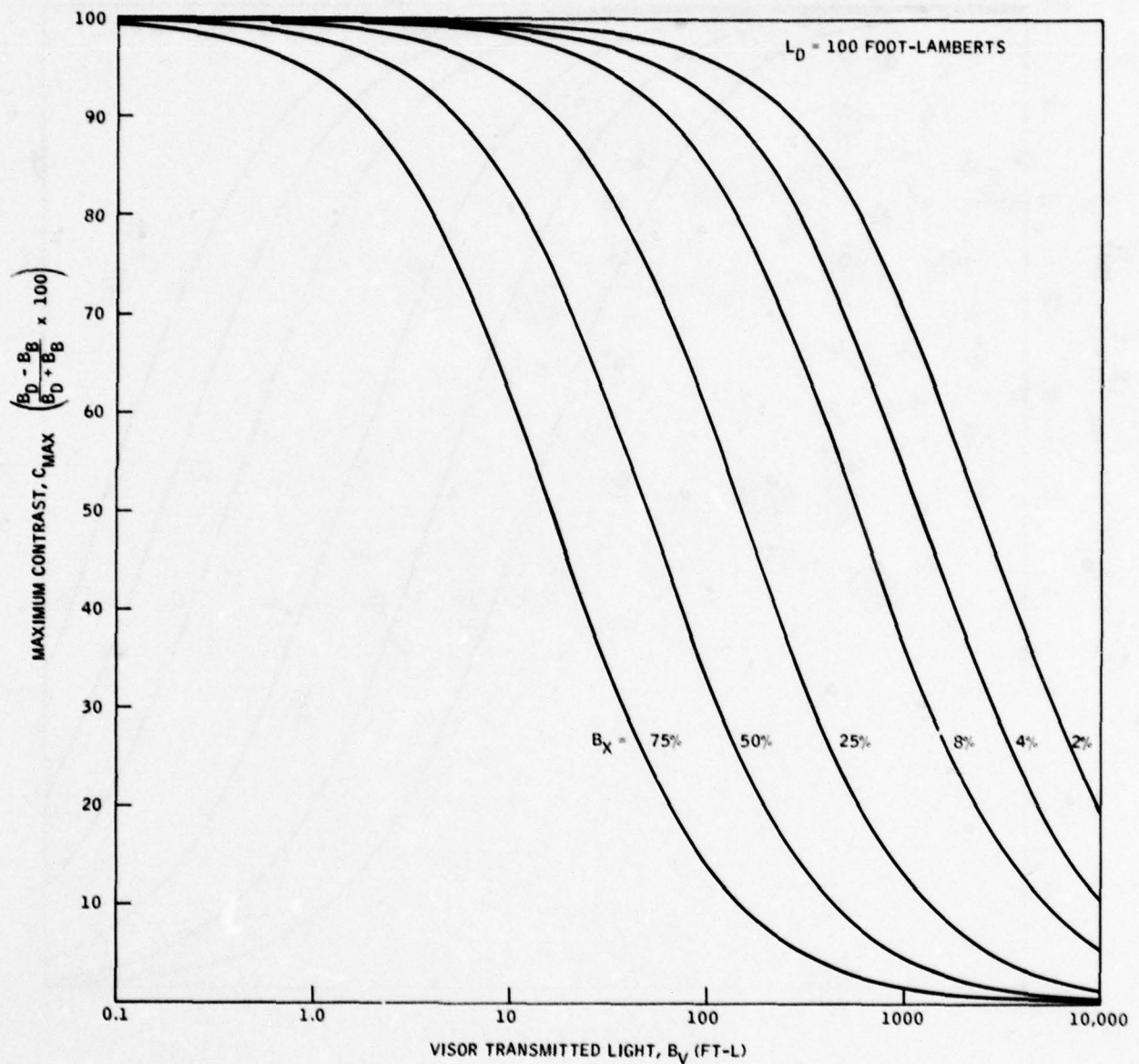


Figure 8. C_{max} , When $L_D = 100$ Foot-Lamberts

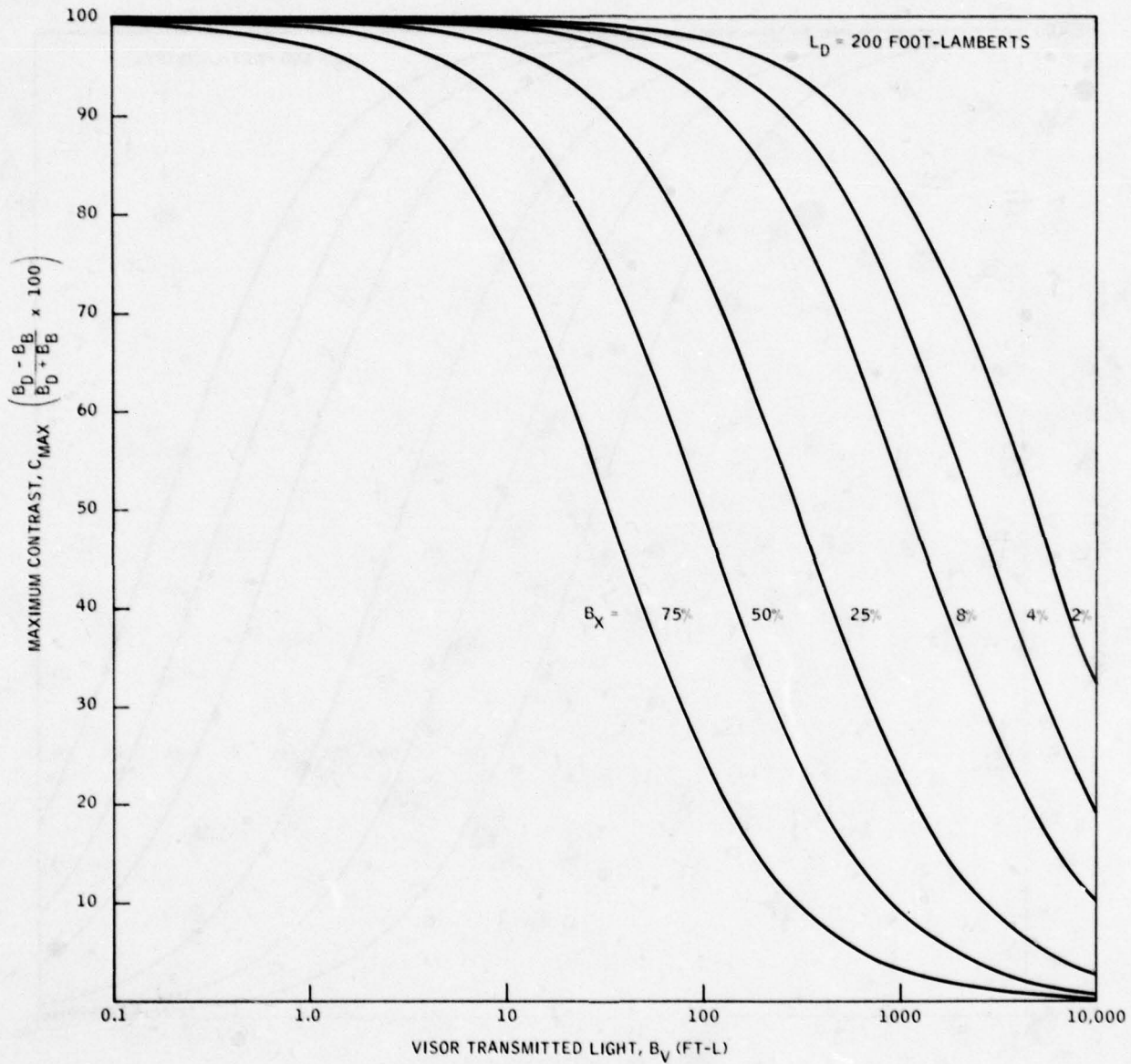


Figure 9. C_{max} , When $L_D = 200$ Foot-Lamberts

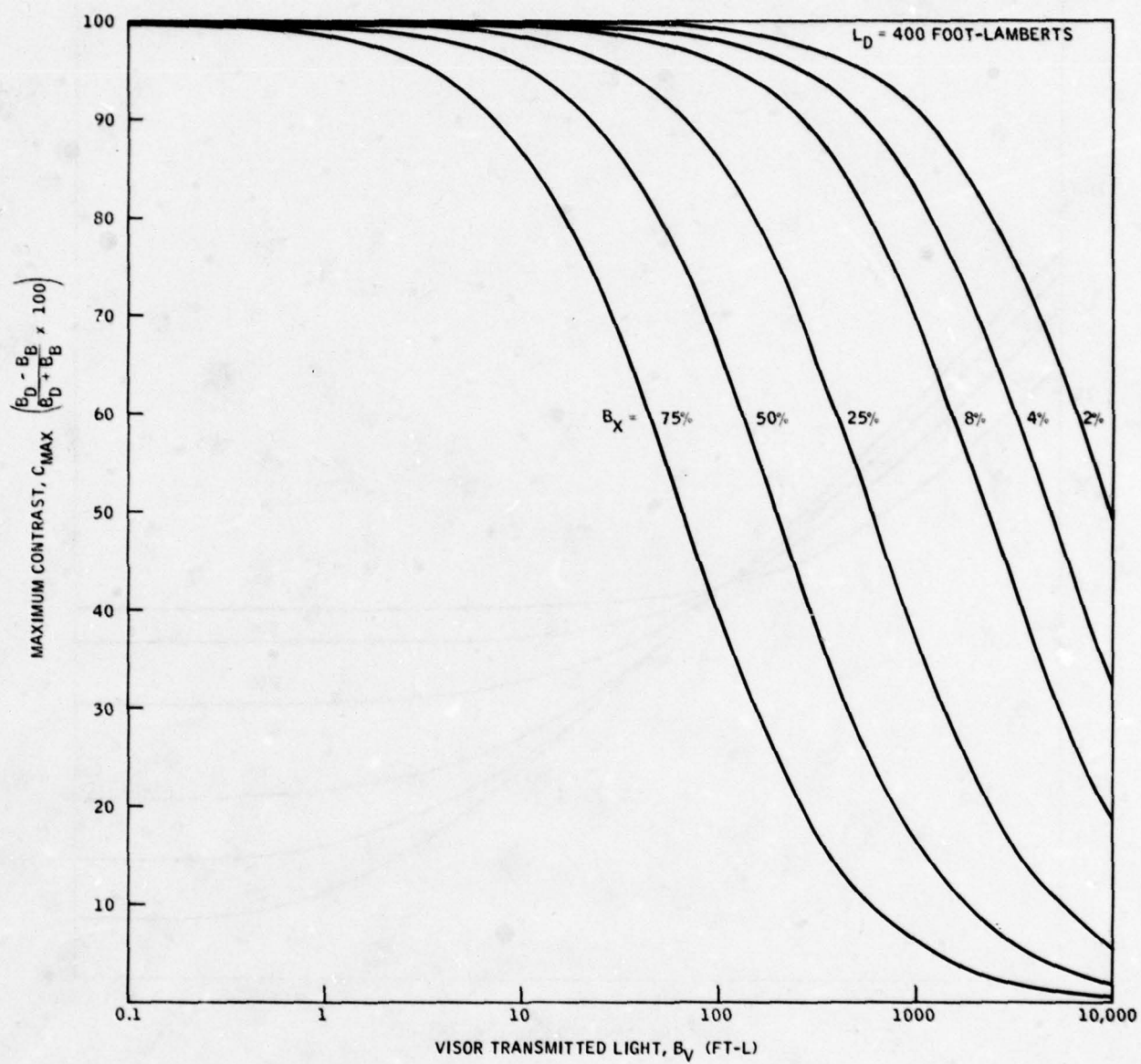


Figure 10. C_{max} , When $L_D = 400$ Foot-Lamberts

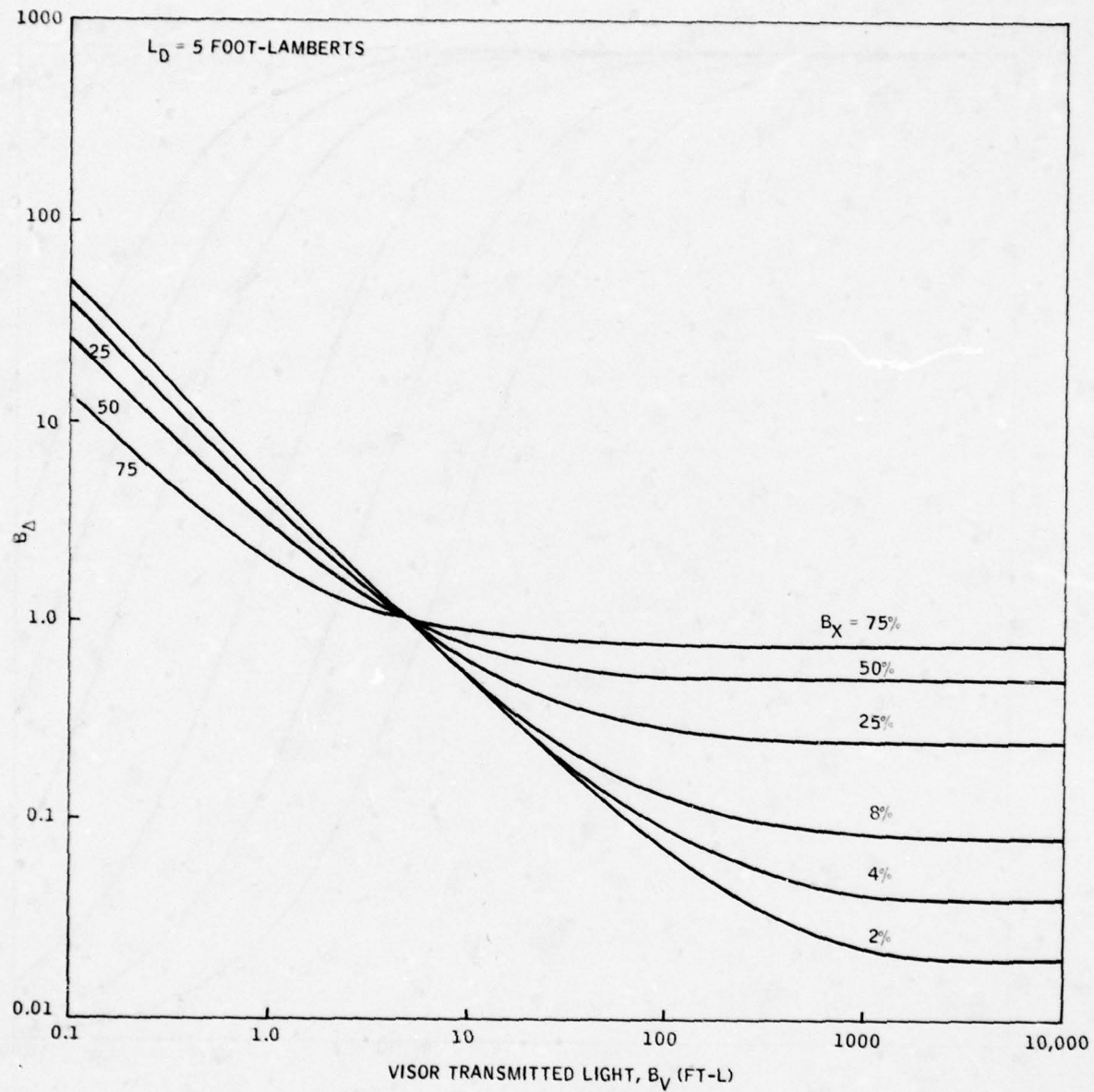


Figure 11. B_D , When $L_D = 5$ Foot-Lamberts

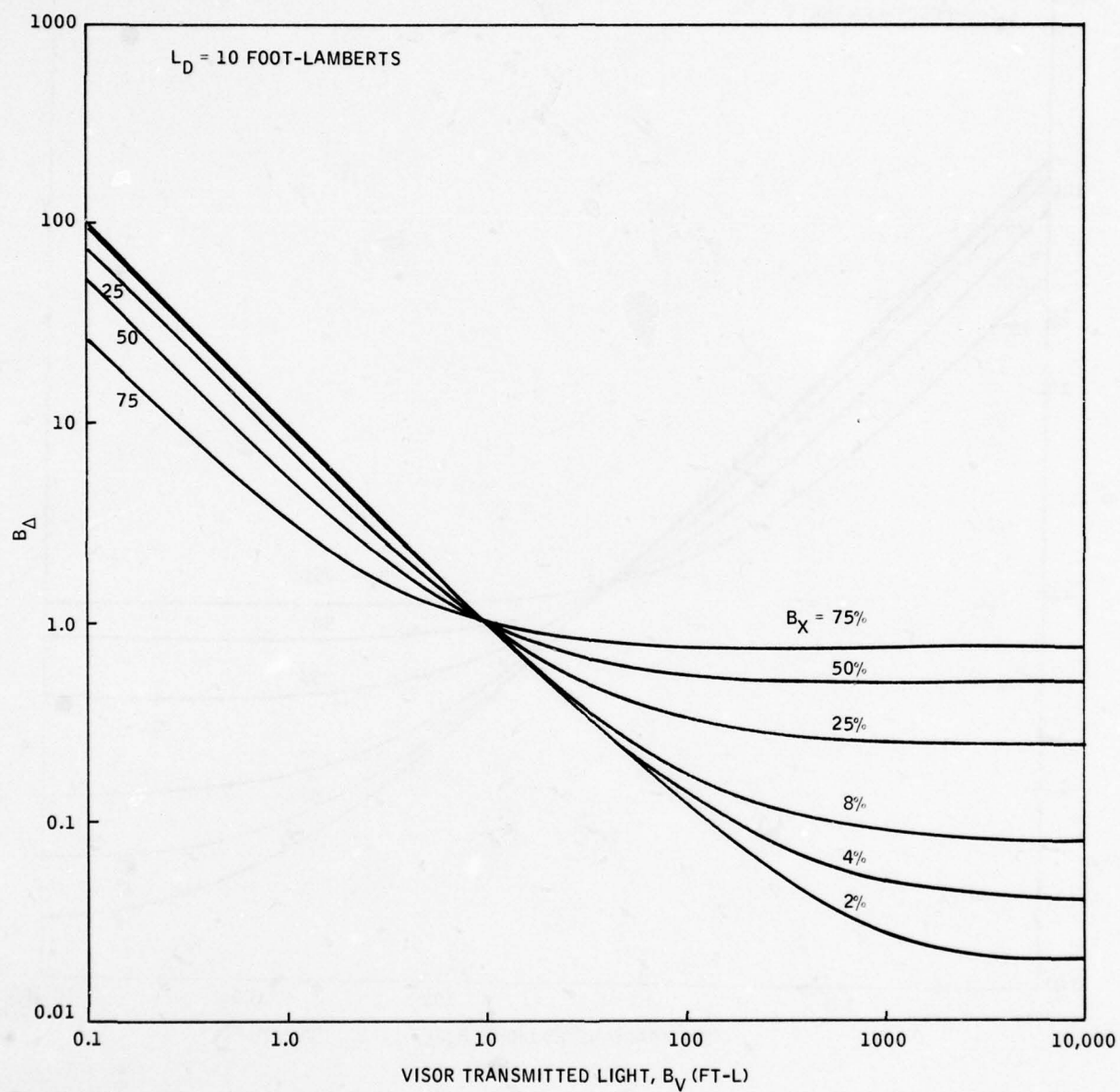


Figure 12. B_{Δ} , When $L_D = 10$ Foot-Lamberts

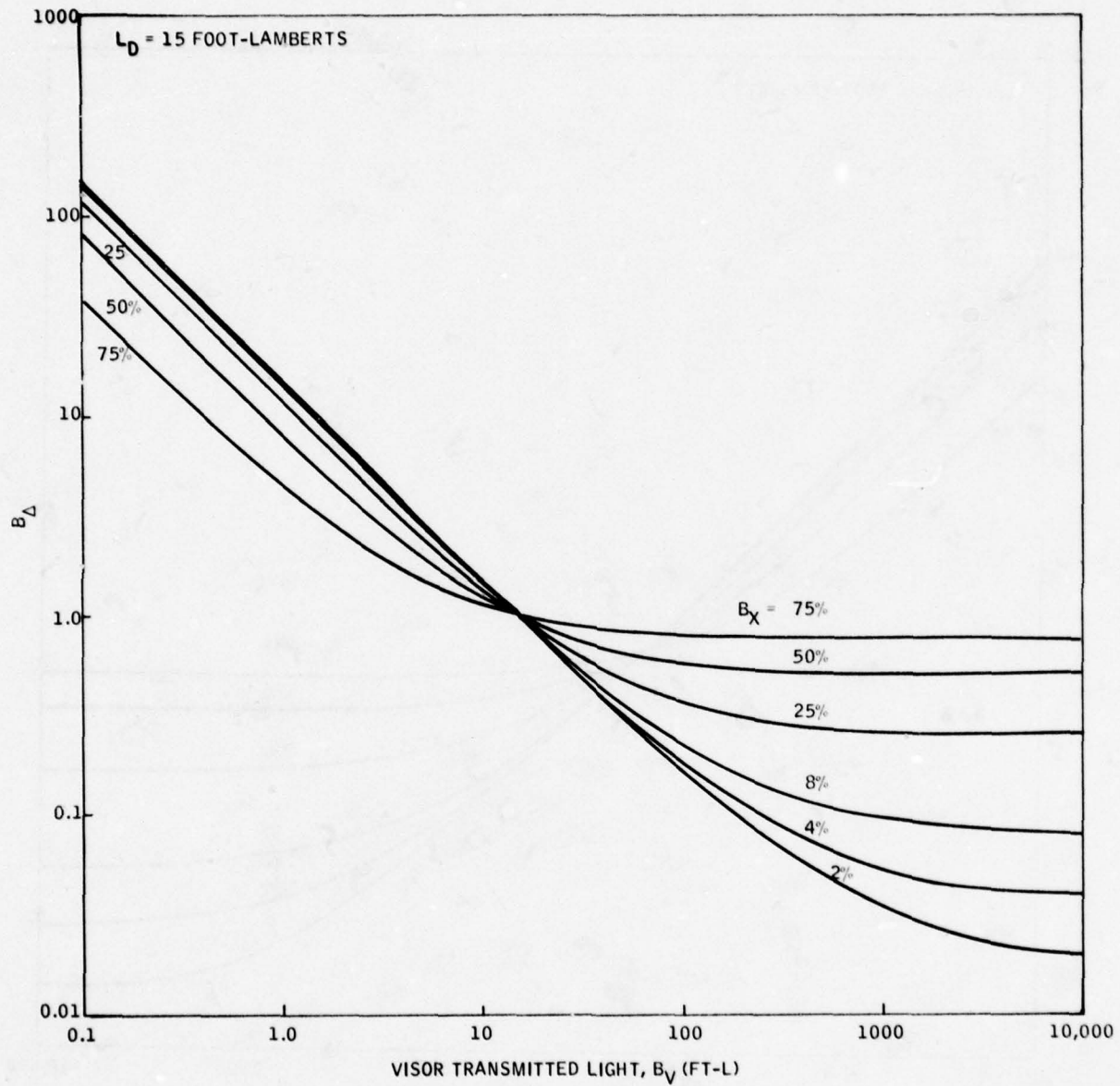


Figure 13. B_{Δ} , When $L_D = 15$ Foot-Lamberts

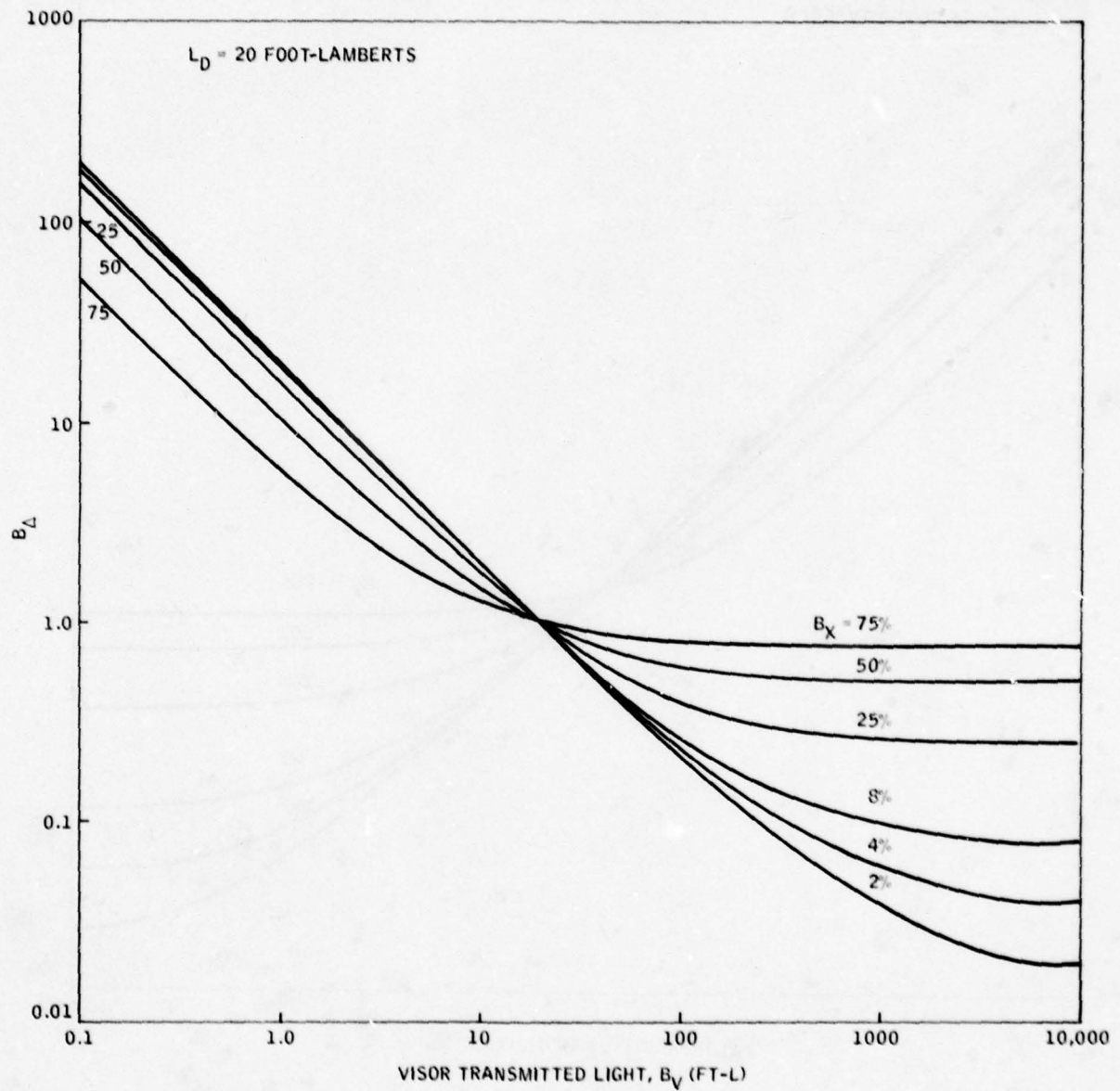


Figure 14. B_{Δ} , When $L_D = 20$ Foot-Lamberts

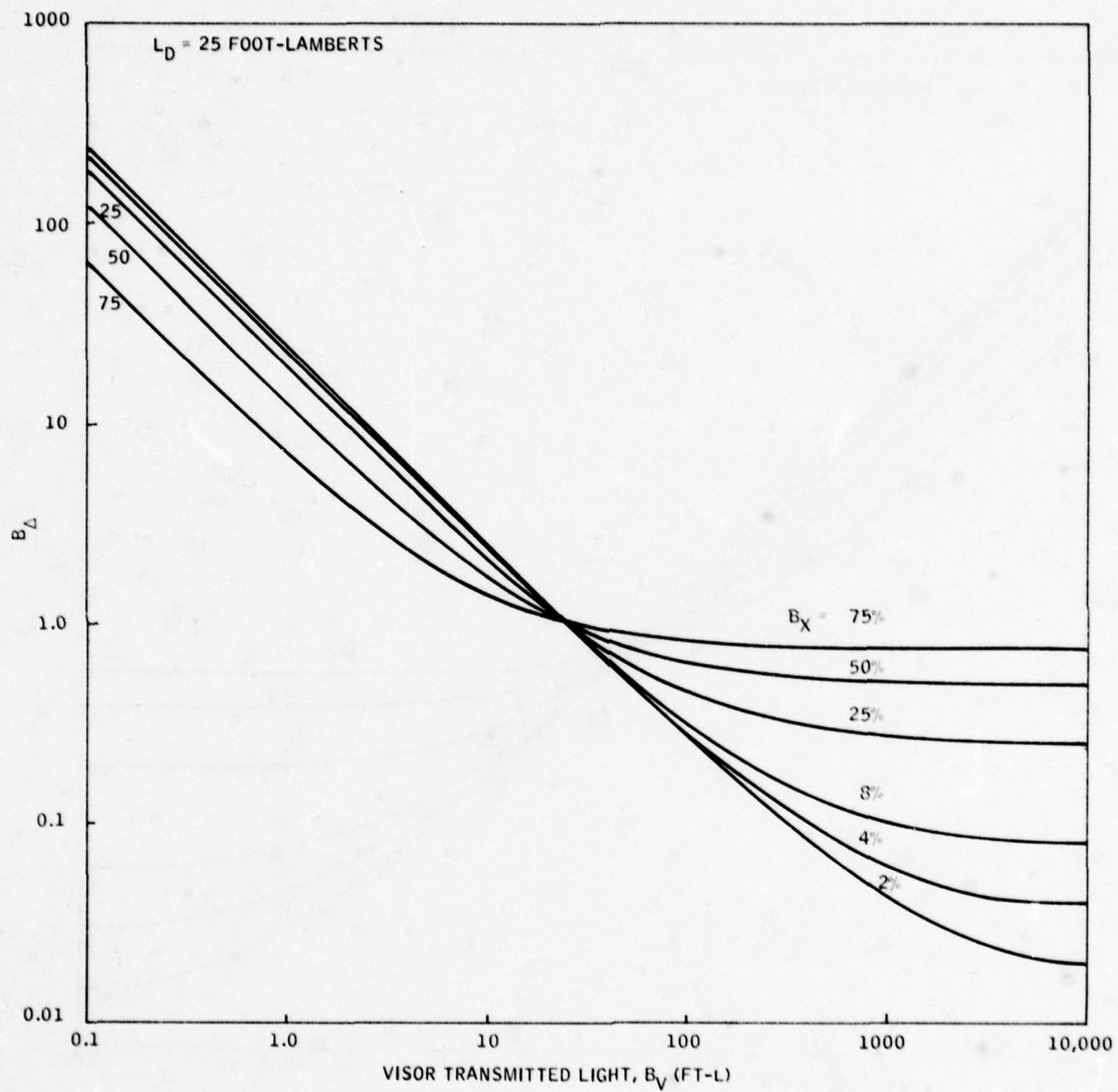


Figure 15. B_{Δ} , When $L_D = 25$ Foot-Lamberts

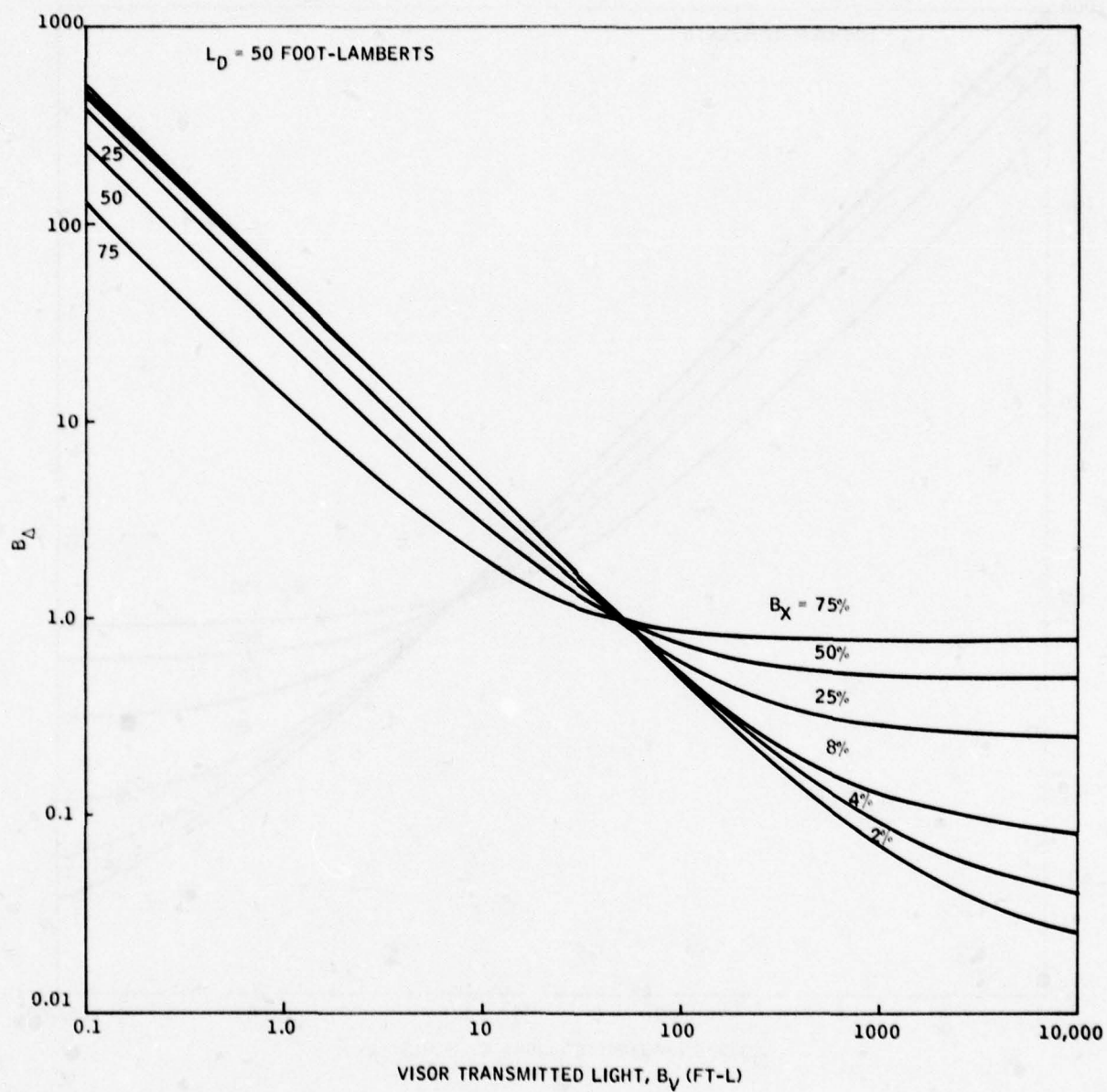


Figure 16. B_{Δ} , When $L_D = 50$ Foot-Lamberts

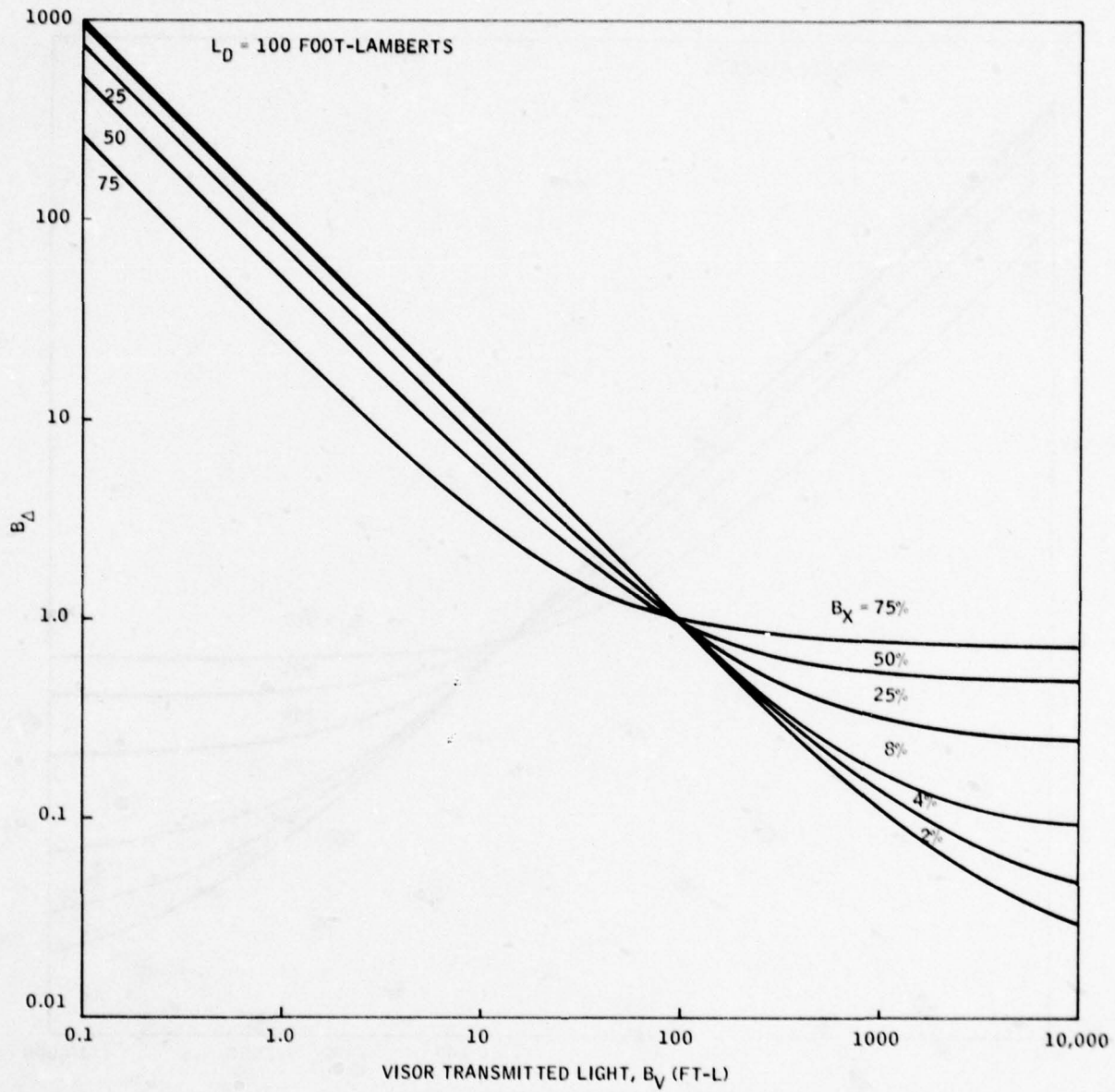


Figure 17. B_{Δ} , When $L_D = 100$ Foot-Lamberts

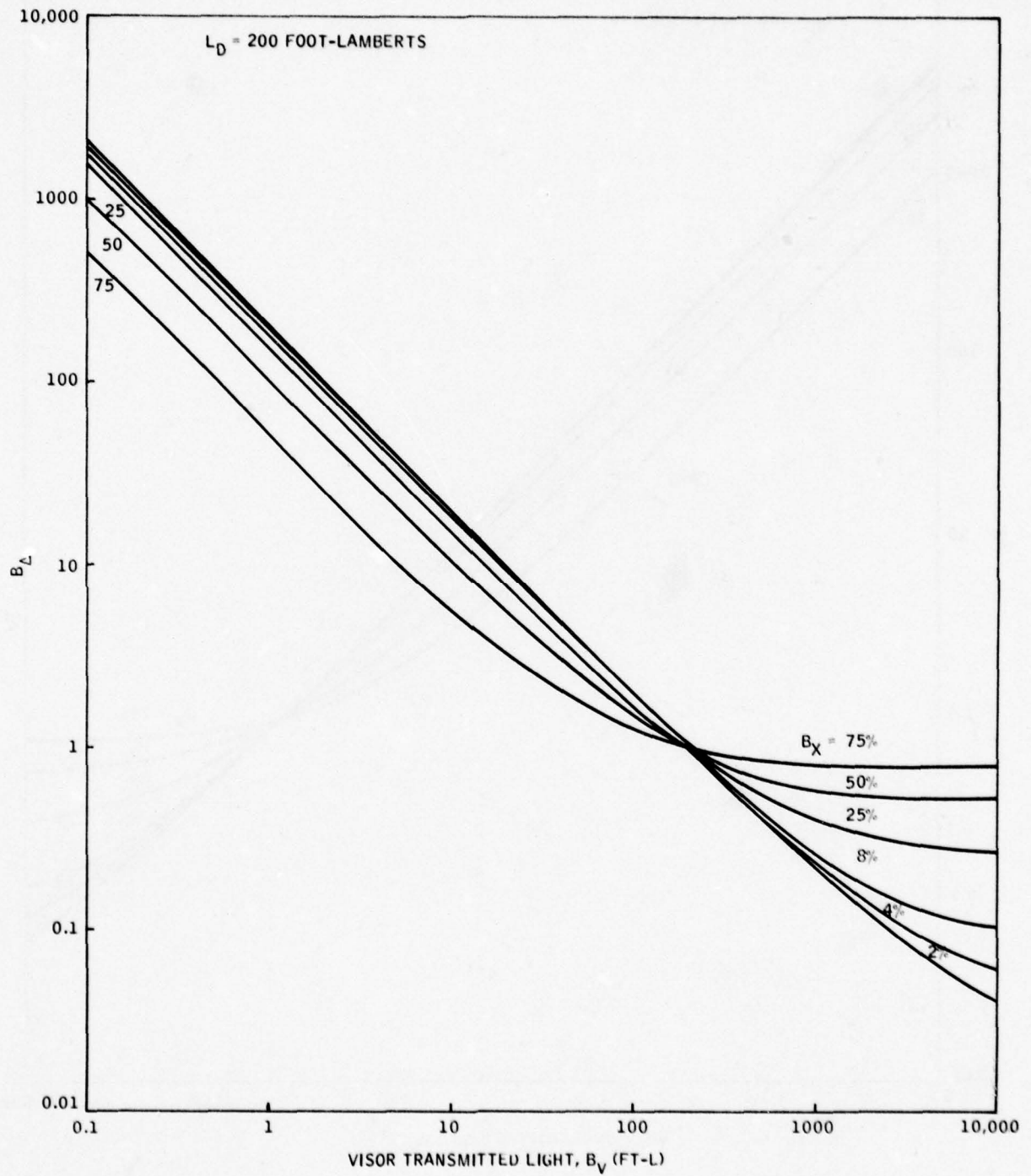


Figure 18. B_{Δ} , When $L_D = 200$ Foot-Lamberts

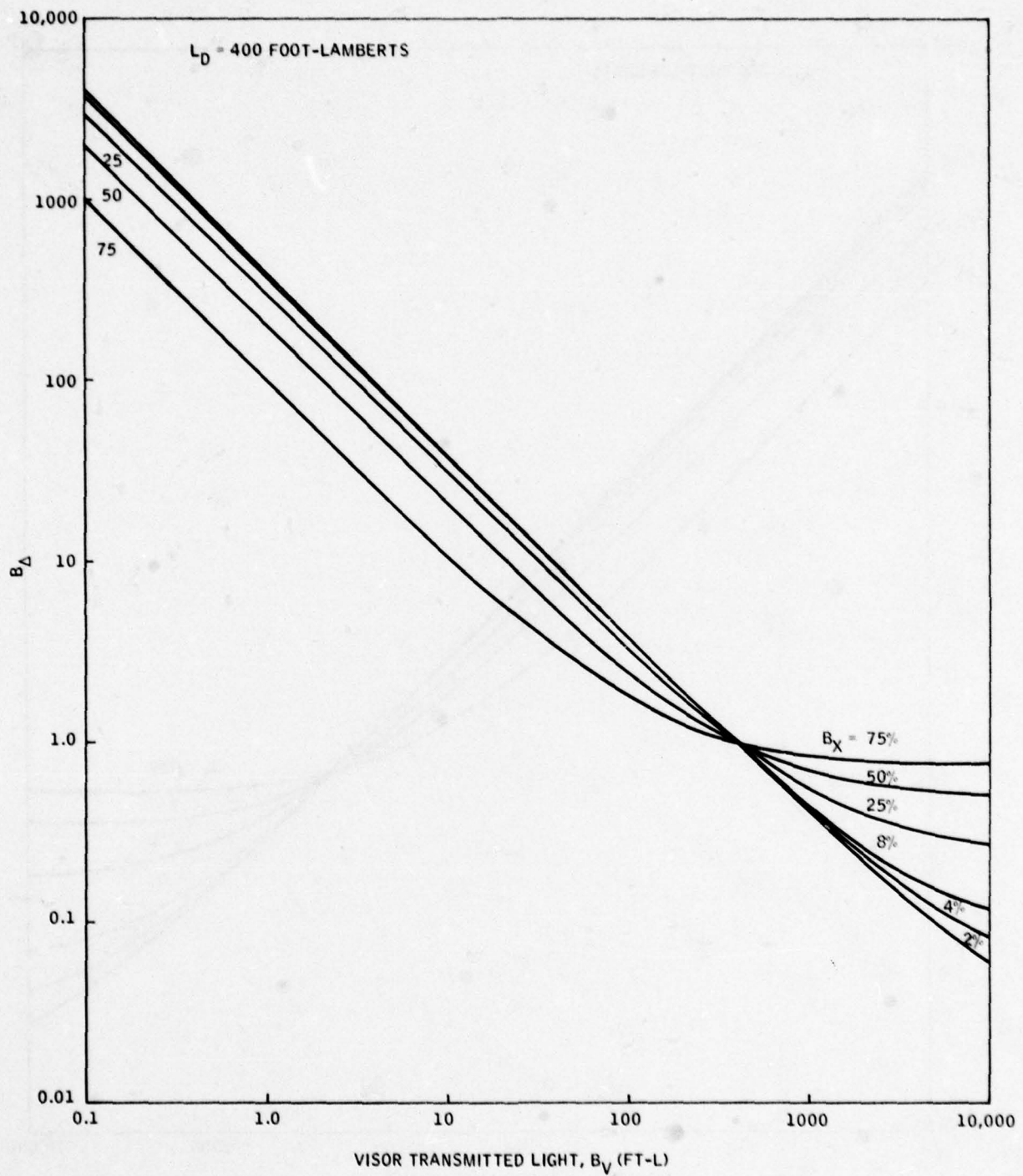


Figure 19. B_{Δ} , When $L_D = 400$ Foot-Lamberts

To use the B_{Δ} curves, select the B_{Δ} template with the desired V_x printed on it and lay it over the desired set of B_{Δ} curves. Those B_x curves that stay completely between the upper and lower limits while traversing between the left and right sides of the rectangle define a combination of V_x , B_x , and L_D that will be acceptable from the standpoint of B_{Δ} .

ACCEPTABLE COMBINATIONS OF VARIABLES

Using the template overlay technique described in the previous paragraphs, those combinations of V_x , B_x , and L_D that will produce acceptable visual performance against various levels of background luminance were tabulated. These data are summarized in Tables 3 through 6. An examination shows that some combinations may produce acceptable performance for all L_B conditions in terms of either C_{max} or B_{Δ} . Similarly, other combinations produce acceptable values of C_{max} and B_{Δ} , but not for all background luminance conditions. A further consolidation of these findings is presented in Table 7. This table essentially "boils down" the results to a single group of data. It is in terms of the data presented in Table 7 that all conclusions contained in Section V have been drawn. Appendixes B and C contain an additional set of curves. These curves differ from Figures 2 through 19 in that all values of L_D are presented on a single page. The templates can be used with these curves in the same way as Figures 2 through 19.

Table 3. Acceptable Performance Levels for a 13-Percent Transmittance Visor¹

Beamsplitter Transmittance (B_x)	Display Luminance (L_D)	Background Luminance (L_B)							
		10 ¹ ft-L		10 ² ft-L		10 ³ ft-L		10 ⁴ ft-L	
		B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}
2%	25 ft-L		•	•	•	/	•		•
	50 ft-L		•	•	•	•	•		•
	100 ft-L		•		•	•	•		•
	200 ft-L		•		•	•	•		•
	400 ft-L		•		•	•	•	•	•
4%	25 ft-L		•	•	•	/	•		•
	50 ft-L		•	•	•	•	•		•
	100 ft-L		•		•	•	•		•
	200 ft-L		•		•	•	•		•
	400 ft-L		•		•	•	•	•	•
8%	25 ft-L		•	•	•	•	•		•
	50 ft-L		•	•	•	•	•		•
	100 ft-L		•		•	•	•		•
	200 ft-L		•		•	•	•	/	•
	400 ft-L		•		•	•	•		•
25%	25 ft-L		•	•	•	•	/	•	
	50 ft-L		•	•	•	•	•	•	
	100 ft-L		•		•	•	•	•	
	200 ft-L		•		•	•	•	•	
	400 ft-L		•		•	•	•	•	•
50%	25 ft-L		•	•	•	•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	/	•	•	•	•	
	200 ft-L		•		•	•	•	•	
	400 ft-L		•		•	•	•	•	
75%	25 ft-L		•	•	•	•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	/	•	•	/	•	
	400 ft-L		•		•	•	•	•	

¹Criteria Limits: $C_{max} \geq 23$ and $0.25 < B_\Delta < 4$; within limits indicated by • outside by $\pm 15\%$ indicated by /.

Table 4. Acceptable Performance Levels for a 25-Percent Transmittance Visor¹

Beamsplitter Transmittance (B_x)	Display Luminance (L_D)	Background Luminance (L_B)							
		10 ¹ ft-L		10 ² ft-L		10 ³ ft-L		10 ⁴ ft-L	
		B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}
2%	25 ft-L		•	•	•		•		
	50 ft-L		•	•	•	/	•		•
	100 ft-L		•	•	•	•	•		•
	200 ft-L		•		•	•	•		•
	400 ft-L		•		•	•	•		•
4%	25 ft-L		•	•	•		•		
	50 ft-L		•	•	•	•	•		
	100 ft-L		•	•	•	•	•		•
	200 ft-L		•		•	•	•		•
	400 ft-L		•		•	•	•		•
8%	25 ft-L		•	•	•		•		
	50 ft-L		•	•	•	•	•		
	100 ft-L		•	•	•	•	•		
	200 ft-L		•		•	•	•		•
	400 ft-L		•		•	•	•	/	•
25%	25 ft-L		•	•	•	•		•	
	50 ft-L		•	•	•	•	•	•	
	100 ft-L		•	•	•	•	•	•	
	200 ft-L		•		•	•	•	•	
	400 ft-L		•		•	•	•	•	
50%	25 ft-L		•	•	•	•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	/	•	•	•	•	
	400 ft-L		•		•	•	•	•	
75%	25 ft-L	•	•	•		•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	•	•	•		•	
	400 ft-L		•		•	•	/	•	

¹ Criteria Limits: $C_{max} \geq 23$ and $0.25 < B_\Delta < 4$; within limits indicated by • outside by $\pm 15\%$ indicated by /.

Table 5. Acceptable Performance Levels for a 50-Percent Transmittance Visor¹

Beamsplitter Transmittance (B_x)	Display Luminance (L_D)	Background Luminance (L_B)							
		10^1 ft-L		10^2 ft-L		10^3 ft-L		10^4 ft-L	
		B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}
2%	25 ft-L		•	•	•		•		
	50 ft-L		•	•	•		•		/
	100 ft-L		•	•	•	/	•		•
	200 ft-L		•	•	•	•	•		•
	400 ft-L		•		•	•	•		•
4%	25 ft-L		•	•	•		•		
	50 ft-L		•	•	•		•		
	100 ft-L		•	•	•	/	•		
	200 ft-L		•	•	•	•	•		•
	400 ft-L		•	•	•	•	•		•
8%	25 ft-L	/	•	•	•		/		
	50 ft-L		•	•	•		•		
	100 ft-L		•	•	•	•	•		
	200 ft-L		•	•	•	•	•		
	400 ft-L		•		•	•	•		•
25%	25 ft-L	•	•	•	•	•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	•	•	•	•	•	
	200 ft-L		•	•	•	•	•	•	
	400 ft-L		•		•	•	•	•	
50%	25 ft-L	•	•	•	/	•		•	
	50 ft-L		•	•	•	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	•	•	•		•	
	400 ft-L		•	/	•	•	•	•	
75%	25 ft-L	•	•	•		•		•	
	50 ft-L	•	•	•		•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	•	•	•		•	
	400 ft-L		•	•	•	•		•	

¹Criteria Limits: $C_{max} \geq 23$ and $0.25 < B_\Delta < 4$; within limits indicated by • outside by $\pm 15\%$ indicated by /.

Table 6. Acceptable Performance Levels for a 100-Percent Transmittance Visor¹

Beamsplitter Transmittance (B_x)	Display Luminance (L_D)	Background Luminance (L_B)							
		10 ¹ ft-L		10 ² ft-L		10 ³ ft-L		10 ⁴ ft-L	
		B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}	B_Δ	C_{max}
2%	25 ft-L	•	•	•	•		•		
	50 ft-L		•	•	•		•		
	100 ft-L		•	•	•		•		/
	200 ft-L		•	•	•	/	•		•
	400 ft-L		•	•	•	•	•		•
4%	25 ft-L	•	•	•	•		•		
	50 ft-L		•	•	•		•		
	100 ft-L		•	•	•		•		
	200 ft-L		•	•	•	/	•		
	400 ft-L		•		•	•	•	•	•
8%	25 ft-L	•	•	•	•				
	50 ft-L	/	•	•	•		/		
	100 ft-L		•	•	•		•		
	200 ft-L		•	•	•	•	•		
	400 ft-L		•	•	•	•	•		
25%	25 ft-L	•	•	•	•	•		•	
	50 ft-L	•	•	•	•	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	•	•	•	•	•	
	400 ft-L		•	•	•	•	•	•	
50%	25 ft-L	•	•	•		•		•	
	50 ft-L	•	•	•	/	•		•	
	100 ft-L		•	•	•	•		•	
	200 ft-L		•	•	•	•		•	
	400 ft-L		•	•	•	•		•	
75%	25 ft-L	•	•	•		•		•	
	50 ft-L	•	•	•		•		•	
	100 ft-L	•	•	•		•		•	
	200 ft-L		•	•	•	•		•	
	400 ft-L		•	•	•	•		•	

¹Criteria Limits: $C_{max} \geq 23$ and $0.25 < B_\Delta < 4$; within limits indicated by • outside by $\pm 15\%$ indicated by /.

Table 7. Combinations of B_x , L_D , and V_x that Fulfill Criteria for Both C_{max} and B (indicated by "•")

V_x	B_x	L_D	L_B				V_x	B_x	L_D	L_B				V_x	B_x	L_D	L_B			
			10^1	10^2	10^3	10^4				10^1	10^2	10^3	10^4				10^1	10^2	10^3	10^4
1%	2%	25					100%	2%	25					100%	2%	25				
		50							50							50				
		100							100							100				
		200							200							200				
4%	4%	25					50%	4%	25					50%	4%	25				
		50							50							50				
		100							100							100				
		200							200							200				
8%	8%	25					25%	8%	25					25%	8%	25				
		50							50							50				
		100							100							100				
		200							200							200				
25%	25%	25					50%	25%	25					50%	25%	25				
		50							50							50				
		100							100							100				
		200							200							200				
50%	50%	25					75%	50%	25					75%	50%	25				
		50							50							50				
		100							100							100				
		200							200							200				
75%	75%	25					100%	75%	25					100%	75%	25				
		50							50							50				
		100							100							100				
		200							200							200				

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

Table 7 summarizes the results of the analysis and from it, one can draw a single outstanding conclusion:

No single combination of visor transmittance (V_x), beamsplitter transmittance (B_x) and display luminance (L_D) will allow acceptable visual performance, from the standpoint of both display contrast (C_{max}) and interocular luminance differences (B_{Δ}), across the anticipated operational range of background luminance conditions (i. e., L_B ranging from 10 to 10,000 foot-Lamberts)!

Further examination of Table 7 reveals some possible solutions, however:

- 1) Although the present design of HMDs does not allow any control of B_x or V_x during flight, the operator can vary his display luminance ("brightness" control). If a "clear" visor ($V_x = 100$), is used in conjunction with the 4 percent beamsplitter transmittance, adjustment of display luminance from 25 foot-Lamberts when L_B is in the 10 to 100 foot-Lambert range, to $L_D = 400$ foot-Lamberts when L_B is in the 1000 to 10,000 foot-Lambert range would provide acceptable visual performance. This is still in the realm of a design goal rather than an operational reality, however. $V_x = 100$ percent and $B_x = 4$ percent can easily be obtained, but $L_D = 400$ foot-Lamberts at the observer's eye is not yet realistic. Although we have obtained high L_D values in the laboratory for short periods of time, it was done so at the expense of tube life. Present CRTs are not capable of sustaining such a high output for extended periods of time. Therefore, it is recommended that consideration be given to developing a long-life CRT capable of developing 400-foot-Lamberts at the operator's eye (400-600 foot-Lamberts at the tube face).

- 2) If pilots object to the clear visor, another possible solution would be to use a variable transmission visor. For example, if $B_x = 8$ percent, then a 50 percent visor transmittance would allow operation at the lower L_B values (10 to 100 foot-Lamberts) and a 13 percent or 25 percent visor could be used for higher L_B values (1000 to 10,000 foot-Lamberts).
- 3) A fixed-visor transmittance of 25 percent could also be used if a variable-transmittance beamsplitter were feasible. Thus, at low L_B values, a 75 percent B_x would permit acceptable visual performance, whereas at higher L_B values, B_x could be reduced to 8 percent.

All of the above three recommended solutions will still require a display luminance range of 25 foot-Lamberts to 400 foot-Lamberts at the operator's eye.

In summary, this study recommends that design efforts be directed toward developing three distinct technological improvements to the present HMD design concept. These are:

- 1) A one-inch, high-resolution CRT capable of producing up to 600 foot-Lamberts at the tube face for extended periods of time without adversely affecting present tube life concepts.
- 2) A variable transmission visor, controlled either by the operator or by a servo mechanism sensitive to rapid changes in ambient luminance. This visor should have a range of transmittance from 13 percent to 100 percent.
- 3) A variable transmission beamsplitter having a B_x range from 2 percent to 75 percent. Again, control could be either by the operator or by a servo-mechanism.

It is important to remember that the predictions of visual performance contained in this report were based upon assumed C_{\max} and B_{Δ} limits. These limits were derived from research studies not wholly applicable to the see-through, monocular HMD. For this reason, the reader is cautioned to use the data presented herein for guidance only! Firm design decisions should be based upon an empirical study now being conducted at the Honeywell Vision Research Laboratory.

SECTION VI
REFERENCES

1. Blackwell, H. R., "Contrast thresholds of the human eye." Journal of the Optical Society of America, 1946, 36, 624-643.
2. Carel, W. L., Pictorial displays for flight. Hughes Aircraft Co., Culver City, California. Technical Report 2732.01/40 (AD 627 669), December 1965.
3. Christensen, J. M., Some typical sky and earth brightnesses at altitudes 10,000 to 40,000 feet and their relationship to the eye-adaptation problems of the radar operator. Army Air Force (AMC), Aeromedical Laboratory, Wright-Patterson Air Force Base, Ohio. Report Number TSEAA-694-11 (AD 494 855), December 1946.
4. Cohen, B. J., and Markoff, J. I., Minimization of binocular rivalry with a see-through helmet mounted sight and display. Paper read at the First Annual Visually Coupled Systems Symposium, Brooks Air Force Base, Texas, November 9, 1972.
5. Cohen, B. J. and Markoff, J. I., Integrated helmet mounted sight and display special human factors report: the presentation of different visual information to each eye. Honeywell, Inc., Minneapolis, Minnesota, Systems and Research Division Report Number IHMS/D-SR1, December 1972.
6. Jacobs, R. S., Triggs, T. J., and Aldrich, J. W., Helmet mounted display/sight system study. Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio. Technical Report AFFDL-TR-7U-83, Vol. 1, March 1971.
7. Kelley, C. R., Ketchel, J. M., and Strudwick, P. H., Experimental evaluation of head-up display high brightness requirements. Kaiser Aerospace and Electronics, Palo Alto, California. Technical Report No. HFR 9765-1 (AD 626 657), November 1965.
8. Ketchel, J. M., An investigation of the effects of high-intensity light adaptation on electronic display visibility. Kaiser Aerospace and Electronics, Palo Alto, California. Technical Report No. HFR 12361-1 (AD 815 222), June 1967.
9. Kling, J. W., and Riggs, L. A. (Eds.), Woodworth & Scholsberg's experimental psychology (third edition). New York: Holt, Rinehart, and Winston, 1971.

10. Levine, S. H., Jauer, R. A., and Kozlowski, D. R., Observer performance with T.V. imagery: gray scale and resolution. McDonnell Douglas Corp., St. Louis, Missouri. Report H398. September 1969.
11. Semple, C. A., Heapy, R. J., Conway, E. J., and Burnette, K. T., Analysis of human factors data for electronic flight display systems. Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio. Technical Report AFFDL-TR-70-174, April 1971.
12. Task, H. L., Contrast considerations for a virtual image display generated on a partially transparent visor. Air Force Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio. Unpublished report, December 1972.
13. Van Cott, H. P., and Kinkade, R. G. (Eds.), Human engineering guide to equipment design (revised edition). Washington, D.C.: U. S. Government Printing Office, 1972.
14. Van Nes, F. L., and Bouman, M. A., "Spatial modulation transfer in the human eye." Journal of the Optical Society of America, 1967, 57, 401-406.
15. Webb, P. (Ed.), Bioastronautics data book. National Aeronautics and Space Administration, Washington, D.C. Report NASA SP-3006, 1964.

APPENDIX A
COMPUTERIZED PREDICTIONS OF CONTRASTS
AND INTEROCULAR LUMINANCE DIFFERENCE RATIOS

The following tables solve for contrast (CABS and CMAX), Shades of gray (SOG) and interocular luminance difference ratio (B_{Δ}) as a function of the following:

- Display Luminance (L_D) =
- Beamsplitter Transmittance (B_X) =
- Visor Transmittance (V_X) =
- Background Luminance (L_B) =

•JOB VISION,COMEN

• NO DATE •
•DATE 12⁷ APR, 1973
•TITLE DISPLAY LUMINANCE AND CONTRAST
•ASSIGN X1=NB,5•CR1A78•TY1A,9•LP1B•

A=00

A1

B. I. COMEN

APR 12 1973

RESEARCH

A=00

A=00

A=00

```

*FORTRAN L5585.
1: COMMON LD(10), BX(10), LB(10), VXX(10), BV(10), BB(10), BD(10),
2:   BDEL(10), CABS(10), CPC(10), CMAX(10), CR(10), SSG(10)
3:   REAL LD, LB
4:   NAMELIST
5:   READ(5,1000) M(LD(1),1:10)
6:   WRITE(9,1000) M(LD(1),1:10)
7:   READ(5,1000) M(BX(1),1:10)
8:   WRITE(9,1000) M(BX(1),1:10)
9:   READ(5,1000) M(VX(1),1:10)
10:  WRITE(9,1000) M(VX(1),1:10)
11:  READ(5,1000) M(LB(1),1:10)
12:  WRITE(9,1000) M(LB(1),1:10)
13:  DO 10 I=1,10
14:    BX(I)=BX(I)/100
15:    VX(I)=VX(I)/100
16:    A=ALOG10(SORT(2))
17:    DO 130 NN=1,N
18:      DO 120 MM=1,M
19:        DO 110 KK=1,K
20:          DO 100 LL=1,L
21:            IF (LB(LL).EQ.0) LB(LL)=1.0E-6
22:            BV(LL)=LB(LL)*VX(KK)
23:            BV(LL)=BV(LL)*BX(MM)
24:            BDEL(LL)=BD(LL)/BV(LL)
25:            CABS(LL)=(BD(LL)-BB(LL))/BB(LL)
26:            CPC(LL)=(BD(LL)-BB(LL))/BD(LL)
27:            CMAX(LL)=(BD(LL)-BB(LL))/(BD(LL)+BB(LL))
28:            CR(LL)=(BD(LL)+BB(LL))/BD(LL)
29:            SSG(LL)=ALOG10(CMAX(LL)/(1-CMAX(LL)))/A+1
30:            CPC(LL)=CPC(LL)*100
31:            CMAX(LL)=CMAX(LL)*100
32:          CONTINUE
33:        IF (SENSE SWITCH 1) 105, 110
34:      CONTINUE
35:    END INPUT(8)
36:  110  WRITE(9,2000) LD(NN), BX(MM)*100+0.5, VX(KK)*100+0.5,
37:    (LB(I),1:10), (BV(I),1:10), (BD(I),1:10), (BDEL(I),1:10),
38:    (CABS(I),1:10), (CPC(I),1:10), (CMAX(I),1:10),
39:    (CR(I),1:10), (SSG(I),1:10)
40:  CONTINUE
41:  120 CONTINUE
42:  130 FORMAT(10F8.0)
43:  2000 FORMAT(1,1,1,36X)IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH#
44:  *4/25X DISPLAY LUMINANCE (LD)2X16,X8F00T-LAMBERTS2/
45:  *17X8BEAM SPLITTER TRANSMISSIVITY (BX)2X16,X8PER CENT2/
46:  *25X8VISOR TRANSMISSIVITY (VX)2X16,X8PER CENT2/X30(4H-----)/
47:  *25X8ACCGROUND LUMINANCE (LB) 19X7(15,4HFL-L)/X30(4H-----)/
48:  *XNET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(BV) 197F9.2/
49:  *30X(F00T-LAMBERTS)2X8/
50:  *XNET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB) 19
51:  *7F9.2/30X(F00T-LAMBERTS)2X8/
52:  *2X8NET DISPLAY LUMINANCE (BD) 197F9.2/
53:  *30X(F00T-LAMBERTS)2X8/
54:  *6X8INTER-6CULAR LUMINANCE DIFFERENCE RATIO (BA) 197F9.2/
55:  *X30(4H-----)/3X8CONTRAST RATIO2X/X30(4H-----)/
56:  *6X8CABS 197F9.2/52X8/8X8CPC 197F9.2/52X8/8X8CMAX 19
57:  *7F9.2/52X8/8X8CR 197F9.2/X30(4H-----)/
58:  *30XSHADES OF GRAY (SSG) 197F9.2/
59:  END

```


DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE 3

AMH

NAME	TYPE	CLASS	9CTAL L9C	DEC WORDS	NAME	TYPE	CLASS	9CTAL L9C	DEC WORDS
A	R	SCALAR	01552P	2	AL9G10	R	SPR9G	00144C	20
BD	R	ARRAY	00170C	20	BDEL	R	ARRAY	00120C	20
BX	R	ARRAY	00244C	20	CABS	R	ARRAY	00310C	20
CPC	R	ARRAY	00264C	20	CR	R	ARRAY	01545P	1
II	I	SCALAR	01551P	1	K	I	SCALAR	01547P	1
L	I	SCALAR	01550P	1	LB	R	ARRAY	00350C	20
LL	I	SCALAR	01557P	1	M	I	SCALAR	01546P	1
N	I	SCALAR	01544P	1	NV	I	SCALAR	01554P	1
SCAT	R	SPR9G	INTRIN	1	VX	R	ARRAY	00074C	20

9CTAL L9C	DEC WORDS	9CTAL L9C	DEC WORDS
1000 00244	100 00514	120 00770	130 00773
1000 00776	2000 01001		

LOCAL VARIABLES (12 WORDS):

01544 N 01545 I
01552 A 01554 NN

BLANK COMMON (260 WORDS):

00000 LD 00024 BX
00170 BD 00214 BDEL
00360 S8G

INTRINSIC SUBPROGRAMS USED:

AL9G10 SORT

HIGHEST ERROR SEVERITY: 0 (NO ERRORS)

DEC WORDS	9CTAL WORDS
GENERATED CODE: 846	01516
CONSTANTS: 14	00016
TEMPERATURES: 8	00010
LOCAL VARIABLES: 12	00014
TOTAL PROGRAM: 880	01560

(PLUS BLANK COMMON)

END OF COMPILATION
ALBAG X,FLIB,MAP,PCB,.

A*00

MAJOR ERRORS

....

NONE

MINOR ERRORS

....

NONE

MEMORY MAP				SIZE	ERRORS
ENTRY				ORIGIN	
LABEL	ENTRY	ORIGIN	SIZE	ERRORS	
M\$WAPS	00407	00000			
M\$VFLFL	00406	00000			
M\$NAME	00401	00000			
M\$PRINT	00275	00000			
M\$EXIT	00264	00000			
M\$ERR	00257	00000			
M\$LOCK	00246	00000			
M\$FREE	00243	00000			
M\$DBIS	00227	00000			
M\$OPEN	00220	00000			
M\$DTEST	00215	00000			
80\$EXIT	46103	46036			
81\$TRIG	46102	46036			
80\$FLAG	46101	46036			
81\$FLAG	46077	46036			
80\$FLAG	46076	46036			
91\$INITIAL	46036	46036			
7\$ERRR	46110	46110			
70\$TBCD	46271	46230			
9\$ERRR	46230	46230			
70\$11ADR	46334	46334			
9\$TOP	46361	46361			
70\$NSERR	46373	46373			
91\$FSWICH	46422	46422			
80\$PX1	46455	46453			
80\$PXH	46453	46453			
9\$TCPX	46457	46457			
91\$DSET	46471	46471			
9AL0G	46524	46524			
9AL0G10	46644	46644			
9\$CRT	46652	46652			
80\$RL0J	47016	47016			
80\$JUELE	47016	47016			
70\$INIT	47403	47016			
90\$DATA	47114	47016			
90\$DATA	47016	47016			
81\$X3	47705	47601			
81\$X2	47704	47601			

DISPLAY LUMINANCE AND CONTRAST		MEMORY MAP		SIZE	ERRORS
LABEL	ENTRY	ORIGIN				
8TX1	47703	47601				
8MDND	47702	47601				
8ENDISL	47701	47601				
8ARGADR	47700	47601				
9ENDISL	47692	47601				
919DATUM	47610	47601				
9DATA	47601	47601				
9GETBUFF	47712	47712				
8EDITFLG	54500	50716				
7EDITRB	53737	50716				
7EDITTB	53515	50716				
9EDIT	50725	50716				
9EDIT	50716	50716				
9DECODE	54570	54564				
91NPUT	54750	54750				
9BCOWRT	56042	56042				
9BCOREAD	56122	56122				

..... PROGRAM LIMITS

PROGRAM LOWER BOUND : 46036
PROGRAM UPPER BOUND : 57777

COMMON LOWER BOUND : 11705
COMMON UPPER BOUND : 12310

STARTING LOC 56220

4DATA

A-00

DISPLAY LUMINANCE AND CONTRAST

L_p
 A_s
 V_k
 L_s

5. 10. 20.
 2. 4. 25.
 13. 25. 100.
 C. C. 1. 10.

25.
 50.
 100.

50.
 75.
 1000.

100.
 1000.
 10000.

200.
 400.

DATE 12 APR 1973
 400.

PAGE

-A1-

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.00	0.01	0.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.00	0.00	0.00	0.03	0.26	2.60	26.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.00	0.03	0.26	2.60	26.00
NET DISPLAY LUMINANCE (BD)	4.90	4.90	4.90	4.93	5.16	7.50	30.90
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	3769.25	376.94	37.71	3.79	0.40	0.06	0.02

CONTRAST RATIOS

CABE	1188461.54	18846.15	1884.62	188.46	18.85	1.88	.19
------	------------	----------	---------	--------	-------	------	-----

CMAX	100.00	99.99	99.89	98.95	90.41	48.51	8.61
------	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	36.05	29.40	22.76	16.13	9.62	4.06	1.50
---------------------	-------	-------	-------	-------	------	------	------

INHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.02	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.00	.00	.05	.50	5.00	50.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.00	.05	.50	5.00	50.00
NET DISPLAY LUMINANCE (BD)	4.90	4.90	4.90	4.95	5.40	9.90	54.90
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	1960.02	196.02	19.62	1.98	.22	.04	.02

CONTRAST RATIOS

CAS	98000.00	9800.00	980.00	98.00	9.80	.98	.10
CMA	100.00	99.98	99.80	98.00	83.05	32.89	4.67

SHADES OF GRAY (SG)	34.16	27.52	20.88	14.26	7.87	2.97	1.27
---------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BY)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1	1	1	1	1	1
CWAX	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

IHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	24500.00	2450.00	245.00	24.50	2.45	.24	.02
CMAX	1	99.99	99.92	99.19	92.45	55.06	10.91	1.21

SHADES OF GRAY (SG)	1	30.16	23.52	16.89	10.34	4.57	1.63	1.07
---------------------	---	-------	-------	-------	-------	------	------	------

JHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAGS	1	92307.69	9230.77	923.08	92.31	9.23	.92	.09
CMAX	1	100.00	99.98	99.78	97.88	82.19	31.58	4.41
SHADES OF GRAY (SOG)	1	33.99	27.34	20.70	14.09	7.71	2.89	1.25

IHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	.00	.02	.25	2.50	25.00	250.00	2500.00
(F90T-LAMBERTS)	1							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.00	.01	.10	1.00	10.00	100.00
(F90T-LAMBERTS)	1							
NET DISPLAY LUMINANCE (BD)	1	4.80	4.80	4.81	4.90	5.80	14.80	104.80
(F90T-LAMBERTS)	1							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1920.04	192.04	19.24	1.96	.23	.06	.04

CONTRAST RATIOS

CABS	1	48000.00	4800.00	480.00	48.00	4.80	.48	.05
CMB	1	100.00	99.96	99.59	96.00	70.59	19.35	2.34

SHADES OF GRAY (SOG)	1	32.10	25.46	18.82	12.23	6.07	2.13	1.14
----------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

	DISPLAY LUMINANCE (LD)	5 FOOT-LAMBERTS	
BEAM SPLITTER TRANSMISSIVITY (BX)	4 PER CENT		
VISOR TRANSMISSIVITY (VX)	50 PER CENT		
BACKGROUND LUMINANCE (LB)	0.01FT-L 0.1FT-L 1FT-L 10FT-L 100FT-L 1000FT-L 10000FT-L		
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00 .05 .50 5.00 50.00 500.00 5000.00		
(FOOT-LAMBERTS)			
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00 .00 .02 .20 2.00 20.00 200.00		
(FOOT-LAMBERTS)			
NET DISPLAY LUMINANCE (BD)	4.80 4.80 4.82 5.00 6.80 24.80 204.80		
(FOOT-LAMBERTS)			
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	960.04 96.04 9.64 1.00 .14 .05 .04		
CONTRAST RATIOS			
CAPS	1 2000.00 2400.00 240.00 24.00 2.40 .24 .02		
CMAX	1 99.99 99.92 99.17 92.31 54.55 10.71 1.19		
SHADES OF GRAY (SG)	1 30.10 23.46 16.83 10.29 4.53 1.62 1.07		

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	12000.00	1200.00	120.00	12.00	1.20	.12	.01
CMB	99.98	99.83	98.36	85.71	37.50	5.66	.60

SHADES OF GRAY (SG)	28.10	21.46	14.84	8.40	3.28	1.33	1.03
---------------------	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BX)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1	1	1	1	1	1
-----	---	---	---	---	---	---	---

CMB	1	1	1	1	1	1	1
-----	---	---	---	---	---	---	---

SHADES OF GRAY (SG)	1	1	1	1	1	1	1
---------------------	---	---	---	---	---	---	---

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	0.02	0.2	2	20	200	2000	20000
(FBOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.00	0.02	0.20	2.00	20.00	200.00
(FBOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	1	4.60	4.60	4.62	4.80	6.60	24.60	204.60
(FBOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1840.08	184.08	18.48	1.92	.26	.10	.08

CONTRAST RATIOS

CAB	1	23000.00	2300.00	230.00	23.00	2.30	.23	.02
CHAX	1	99.99	99.91	99.14	92.00	53.49	10.31	1.14

SHADES OF GRAY (SG)	1	29.98	23.34	16.70	10.17	4.44	1.60	1.07
---------------------	---	-------	-------	-------	-------	------	------	------

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	11500.00	1150.00	115.00	11.50	1.15	.11	.01
-----	----------	---------	--------	-------	------	-----	-----

CMA	99.9%	99.83	98.29	85.19	36.51	5.44	.57
-----	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	1	27.98	21.34	14.72	8.29	3.21	1.31	1.03
---------------------	---	-------	-------	-------	------	------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

BEAM SPLITTER TRANSMISSIVITY (BX)	DISPLAY LUMINANCE (LD)		5 FOOT-LAMBERTS		8 PER CENT		100 PER CENT	
	VISOR TRANSMISSIVITY (VX)		0.01FT-L		0.1FT-L		1FT-L	
			0.01FT-L		0.1FT-L		1FT-L	
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.01	.10	1.00	10.00	100.00	1000.00	10000.00
(FOOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.01	.08	.80	8.00	80.00	800.00
(FOOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	1	.60	.61	.68	5.40	12.60	84.60	804.60
(FOOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	.60	.08	.68	.54	.13	.08	.08
CONTRAST RATIOS								
CAGS	1	5750.00	575.00	57.50	5.75	.57	.06	.01
CHAX	1	99.97	99.65	96.64	74.19	22.33	2.79	.29
SHADES OF GRAY (SOG)	1	25.98	19.34	12.74	6.51	2.31	1.16	1.02

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE

- A14 -

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.00	.03	.32	3.25	32.50	325.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.03	.32	3.25	32.50	325.00
NET DISPLAY LUMINANCE (BD)	3.75	3.75	3.78	4.07	7.00	36.25	328.75
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	288.87	288.71	29.10	3.13	.54	.28	.25

CONTRAST RATIOS

CBS	11538.46	1153.85	115.38	11.54	1.15	.12	.01
CMB	99.98	99.83	98.30	85.23	36.59	5.45	.57

SHADES OF GRAY (SG)	27.99	21.35	14.73	8.30	3.21	1.32	1.03
---------------------	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	6000.00	600.00	60.00	6.00	0.60	0.06	0.01
CMAX	99.97	99.67	96.77	75.00	23.08	2.91	0.30

SHADES OF GRAY (SG)	26.10	19.46	12.86	6.61	2.36	1.17	1.02
---------------------	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS
 BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT
 VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD)	3.75	3.76	3.87	5.00	16.25	128.75	1253.75
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	750.25	75.25	7.75	1.00	.32	.26	.25

CONTRAST RATIOS

CAS	3000.00	300.00	30.00	3.00	.30	.03	.00
CMAX	99.93	99.34	93.75	60.00	13.04	1.48	.15

SHADES OF GRAY (SG)	24.10	17.47	10.91	5.00	1.76	1.09	1.01
---------------------	-------	-------	-------	------	------	------	------

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)							
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (RV)	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET DISPLAY LUMINANCE (BD)	3.75	3.77	4.00	6.25	28.75	253.75	2503.75
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	375.25	37.75	4.00	.62	.29	.25	.25

CONTRAST RATIOS

CAS	1500.00	150.00	15.00	1.50	.15	.01	.00
-----	---------	--------	-------	------	-----	-----	-----

CMA	99.87	98.68	88.24	42.86	6.98	.74	.07
-----	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (SG)	22.10	15.48	9.00	3.64	1.40	1.04	1.00
---------------------	-------	-------	------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BX)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BX)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
CONTRAST RATIOS							
CBS	3846.15	384.62	38.46	3.85	.38	.04	.00

CMAX 99.95 99.98 95.06 65.79 16.13 1.89 .19

SHADES OF GRAY (SG) 1 24.82 18.18 11.60 5.55 1.94 1.11 1.01

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	2000.00	200.00	20.00	2.00	.20	.02	.00
-----	---	---------	--------	-------	------	-----	-----	-----

CMB	1	99.90	99.01	90.91	50.00	9.09	.99	.10
-----	---	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (SG)	1	22.93	16.30	9.78	4.17	1.53	1.06	1.01
---------------------	---	-------	-------	------	------	------	------	------

THMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I							
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) I	.00	.05	.50	5.00	50.00	500.00	5000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD) I	2.50	2.52	2.75	5.00	27.50	252.50	2502.50
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	500.50	50.50	5.50	1.00	.55	.50	.50

CONTRAST RATIOS

CABS I	1000.00	100.00	10.00	1.00	.10	.01	.00
CHAX I	99.80	98.04	83.33	33.33	4.76	.50	.05

SHADES OF GRAY (SG) I	20.93	14.32	7.92	3.00	1.28	1.03	1.00
-----------------------	-------	-------	------	------	------	------	------

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.1	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.01	0.1	1.00	10.00	100.00	1000.00	10000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITH IN BEAM SPLITTER (BB)	0.01	0.1	1.00	10.00	100.00	1000.00	10000.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	2.50	2.55	3.00	7.50	52.50	502.50	5002.50
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	250.50	25.50	3.00	.75	.52	.50	.50

CONTRAST RATIOS

CBS 500.00 50.00 5.00 .50 .05 .00 .00

CMS 99.60 96.15 71.43 20.00 2.44 .25 .02

SHADES OF GRAY (SG) 18.94 12.34 6.17 2.17 1.14 1.01 1.00

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1282.05	128.21	12.82	1.28	.13	.01	.00
CMAX	1	99.84	98.46	86.51	39.06	6.02	.64	.06

SHADES OF GRAY (SG)	1	21.65	15.03	8.58	3.38	1.35	1.04	1.00
---------------------	---	-------	-------	------	------	------	------	------

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (RV)	1	0.02	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.02	0.19	1.87	18.75	187.50	1875.00
NET DISPLAY LUMINANCE (BD)	1	1.25	1.44	3.12	20.00	188.75	1876.25
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	500.75	5.75	1.25	.80	.75	.75

CONTRAST RATIOS

CBS	666.67	66.67	6.67	.67	.07	.01	.00
CMB	99.70	97.09	76.92	25.00	3.23	.33	.03

SHADES OF GRAY (SG)	19.77	13.16	6.88	2.47	1.19	1.02	1.00
---------------------	-------	-------	------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

[illegible]

IHWS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 5 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAPS	166.67	16.67	1.67	.17	.02	.00	.00
CHAX	98.81	89.29	45.45	7.69	.83	.08	.01
SHADES OF GRAY (SOG)	15.78	9.29	3.83	1.44	1.05	1.00	1.00

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BO)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1376923.08	37692.31	3769.23	376.92	37.69	3.77	.38
CMAX	1	100.00	99.99	99.95	99.97	94.96	65.33
SHADES OF GRAY (SG)	1	38.05	31.90	24.76	18.12	11.55	5.31
							1.92

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

	10 FOOT-LAMBERTS	2 PER CENT	25 PER CENT						
	10 FOOT-LAMBERTS	2 PER CENT	25 PER CENT						
DISPLAY LUMINANCE (LD)									
BEAM SPLITTER TRANSMISSIVITY (BX)									
VISOR TRANSMISSIVITY (VX)									
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L		
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1	1	1
CONTRAST RATIOS									
CBS	1196000.00	19600.00	1960.00	196.00	19.60	1.96			
CMAX	1	100.00	99.99	99.90	98.99	90.74	49.49	8.93	
SHADES OF GRAY (SG)	1	36.16	29.52	22.87	16.24	9.73	4.13	1.52	

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I							
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS) I	.00	.00	.01	.10	1.00	10.00	100.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD) I	9.80	9.80	9.81	9.90	10.80	19.80	109.80
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	1960.02	196.02	19.62	1.98	.22	.04	.02

CONTRAST RATIOS

CBS I	98000.00	9800.00	980.00	98.00	9.80	.98	.10
CMAX I	100.00	99.98	99.80	98.00	83.05	32.89	4.67
SHADES OF GRAY (SG) I	34.16	27.52	20.88	14.26	7.87	2.97	1.27

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

	10 FOOT-LAMBERTS	2 PER CENT	100 PER CENT						
DISPLAY LUMINANCE (LD)									
BEAM SPLITTER TRANSMISSIVITY (BX)									
VISOR TRANSMISSIVITY (VX)									
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L	
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.01	.10	1.00	10.00	100.00	1000.00	10000.00	
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.00	.02	.20	2.00	20.00	200.00	
NET DISPLAY LUMINANCE (BD)	1	9.80	9.80	9.82	10.00	11.80	29.80	209.80	
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	980.02	98.02	9.82	1.00	.12	.03	.02	
CONTRAST RATIOS									
CAS	1	49000.00	4900.00	490.00	49.00	4.90	.49	.05	
CMAX	1	100.00	99.96	99.59	96.08	71.01	19.68	2.39	
SHADES OF GRAY (SG)	1	32.16	25.52	18.88	12.29	6.12	2.15	1.14	

H. 2000-10-10

156

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

	10 FOOT-LAMBERTS	4 PER CENT	13 PER CENT	
DISPLAY LUMINANCE (LD)				
BEAM SPLITTER TRANSMISSIVITY (BX)				
VISOR TRANSMISSIVITY (VX)				
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L 100FT-L 1000FT-L 10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.01	.13	1.30 13.00 130.00 1300.00
(FOOT-LAMBERTS)				
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.01	.05 .52 5.20 52.00
(FOOT-LAMBERTS)				
NET DISPLAY LUMINANCE (BD)	9.60	9.60	9.61	9.65 10.12 14.80 61.60
(FOOT-LAMBERTS)				
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	7384.66	738.50	73.89	7.42 .78 .11 .05
CONTRAST RATIOS				
CABS	184615.38	18461.54	1846.15	184.62 18.46 1.85 .18
CMAX	100.00	99.99	99.89	98.93 90.23 48.00 8.45
SHADES OF GRAY (S8G)	35.99	29.34	22.70	16.07 9.57 4.32 1.49

IMHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (RV)	0.00	0.02	0.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.01	0.10	1.00	10.00	100.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	9.60	9.60	9.61	9.70	10.60	19.60	109.60
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	3840.04	384.04	38.44	3.88	0.42	0.08	0.04

CONTRAST RATIOS

CABS	96000.00	9600.00	960.00	96.00	9.60	0.96	0.10
------	----------	---------	--------	-------	------	------	------

CHAX

	100.00	99.98	99.79	97.96	82.76	32.43	4.58
--	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SGG)	34.10	27.46	20.82	14.20	7.81	2.94	1.26
----------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

BACKGROUND LUMINANCE (LB) 1 0.01FT-L 0.1FT-L 1FT-L 10FT-L 100FT-L 1000FT-L 10000FT-L

NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) 1 .00 .05 .50 5.00 50.00 500.00 5000.00

NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) 1 .00 .00 .02 .20 2.00 20.00 200.00

NET DISPLAY LUMINANCE (BD) 1 9.60 9.60 9.62 9.80 11.60 29.60 209.60

INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR) 1 1920.04 192.04 19.24 1.96 .23 .06 .04

CONTRAST RATIOS

CAS 1 48000.00 4800.00 480.00 48.00 4.80 .48 .05

CMA 1 100.00 99.96 99.59 96.00 70.59 19.35 2.34

SHADES OF GRAY (SG) 1 32.10 25.46 18.82 12.23 6.07 2.13 1.14

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) * PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

BACKGROUND LUMINANCE (LB) 1 0.01FT-L 0.1FT-L 1FT-L 10FT-L 100FT-L 1000FT-L 10000FT-L

NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) 1 .01 .10 1.00 10.00 100.00 1000.00 10000.00

NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) 1 .00 .00 .04 .40 4.00 40.00 400.00

NET DISPLAY LUMINANCE (BD) 1 9.60 9.60 9.64 10.00 13.60 49.60 409.60

INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) 1 960.04 96.04 9.64 1.00 .14 .05 .04

CONTRAST RATIOS

CBS 1 24000.00 2400.00 240.00 24.00 2.40 .24 .02

CHAX 1 1

1 99.99 99.92 99.17 92.31 54.55 10.71 1.19

SHADES OF GRAY (SG) 1 1

1 30.10 23.46 16.83 10.29 4.53 1.62 1.07

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.13	1.30	13.00	130.00	1300.00	
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.00	0.01	0.10	1.04	10.40	104.00	
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.01	0.10	1.04	10.40	
NET DISPLAY LUMINANCE (BD)	9.20	9.20	9.21	9.30	10.24	19.60	113.20
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (Ba)	7077.00	707.77	70.85	7.16	.79	.15	.09

CONTRAST RATIOS

CBS	88461.54	8846.15	884.62	88.46	8.85	.88	.09
-----	----------	---------	--------	-------	------	-----	-----

CHX	100.00	99.98	99.77	97.79	81.56	30.67	4.24
-----	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	33.87	27.22	20.58	13.97	7.60	2.83	1.24
---------------------	-------	-------	-------	-------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	10 FOOT-LAMBERTS	8 PER CENT	25 PER CENT
BEAM SPLITTER TRANSMISSIVITY (BX)			
VISOR TRANSMISSIVITY (VX)			
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(BV)	1	.00	.02
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB)	1	.00	.02
NET DISPLAY LUMINANCE (BD)	1	9.20	9.20
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	3680.08	368.08
CONTRAST RATIOS			
CABS	1	46000.00	4600.00
CMAx	1	100.00	99.96
SHADES OF GRAY (SOG)	1	31.98	25.34

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 9 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	0.05	0.5	5	50	500	5000
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.04	0.4	4	40	400
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	9.20	9.24	9.60	13.20	49.20	409.20
(FOOT-LAMBERTS)							
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1840.08	184.08	18.48	1.92	.26	.08

CONTRAST RATIOS

CABS	1	23000.00	2300.00	230.00	23.00	2.30	.23	.02
------	---	----------	---------	--------	-------	------	-----	-----

C_{MAX} 1 99.99 99.91 99.14 92.00 53.49 10.31 1.14

SHADES OF GRAY (SG)	1	29.98	23.34	16.70	10.17	4.44	1.60	1.07
---------------------	---	-------	-------	-------	-------	------	------	------

14MS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 9 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	11500.00	1150.00	115.00	11.50	1.15	.11	.01
CMAX	99.98	99.83	98.29	85.19	36.51	5.44	.57
SHADES OF GRAY (SG)	27.98	21.34	14.72	8.29	3.21	1.31	1.03

IHM/S/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAGS	1	23076.92	2307.69	230.77	23.08	2.31	.23	.02
CMAX	1	99.99	99.91	99.14	92.02	53.57	10.34	1.14
SHADES OF GRAY (SG)	1	29.99	23.35	16.71	10.18	4.45	1.60	1.07

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

	12000:00	1200:00	120:00	12:00	1:20	1:12	1:01
CBS	1	1	1	1	1	1	1
CMAX	1	1	1	1	1	1	1

	28:10	21:06	14:04	8:00	3:28	1:33	1:03
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS
 BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT
 VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	110000FT-L
BACKGROUND LUMINANCE (LB) I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I							
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	.00	.01	.12	1.25	12.50	125.00	1250.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD) I	7.50	7.51	7.62	8.75	20.00	132.50	1257.50
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	1500.25	150.25	15.25	1.75	.40	.26	.25
CONTRAST RATIOS							
CBS I	6000.00	600.00	60.00	6.00	.60	.26	.21
CMAX I	99.97	99.67	96.77	75.00	23.08	2.91	.30
SHADES OF GRAY (SG) I	26.10	19.46	12.86	6.61	2.36	1.17	1.02

INHS/C DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) (FOOT-LAMBERTS)	0.00	0.22	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) (FOOT-LAMBERTS)	7.50	7.52	7.75	10.00	32.50	257.50	2507.50
NET DISPLAY LUMINANCE (BD) (FOOT-LAMBERTS)	750.25	75.25	7.75	1.00	0.32	0.26	0.25
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)							

CONTRAST RATIOS

CBS	3000.00	300.00	30.00	3.00	0.30	0.23	0.00
CMAX	99.93	99.34	93.75	60.00	13.04	1.48	0.15

SHADES OF GRAY (SG)	24.10	17.47	10.91	5.00	1.76	1.09	1.01
---------------------	-------	-------	-------	------	------	------	------

INHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	7692.31	769.23	76.92	7.69	.77	.08	.01
-----	---------	--------	-------	------	-----	-----	-----

CMAX	99.97	99.74	97.47	79.37	27.78	3.70	.36
------	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	26.82	20.18	13.57	7.24	2.65	1.21	1.02
---------------------	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS
 BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT
 VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	4000.00	400.00	40.00	4.00	.40	.04	.00
CMAX	1	99.95	99.50	95.24	66.67	16.67	1.96	.20

SHADES OF GRAY (SG)	1	24.93	18.29	11.72	5.64	1.97	1.11	1.01
---------------------	---	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.03	.50	5.00	50.00	500.00	5000.00	
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.02	.25	2.50	25.00	250.00	2500.00	
NET DISPLAY LUMINANCE (BD)	5.00	5.25	7.50	30.00	255.00	2505.00	
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1000.50	100.50	10.50	1.50	.60	.51	.50

CONTRAST RATIOS

CBS	2000.00	200.00	20.00	2.00	.20	.02	.00
CMB	99.90	99.01	90.91	50.00	9.09	.99	.10

SHADES OF GRAY (SG)	22.93	16.30	9.78	4.17	1.53	1.06	1.01
---------------------	-------	-------	------	------	------	------	------

IWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	5.00	5.05	5.50	10.00	55.00	505.00	5005.00
NET DISPLAY LUMINANCE (BD) I	500.50	50.50	5.50	1.00	.55	.50	.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I							

CONTRAST RATIOS

CBS I	1000.00	100.00	10.00	1.00	.10	.01	.00
CWAX I	99.80	98.04	83.33	33.33	4.76	.50	.05

SHADES OF GRAY (SG) I	20.93	14.32	7.92	3.00	1.28	1.03	1.00
-----------------------	-------	-------	------	------	------	------	------

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.00	0.01	0.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.00	0.01	0.10	0.97	9.75	97.50	975.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	0.00	0.01	0.10	0.97	9.75	97.50	975.00
NET DISPLAY LUMINANCE (BD)	2.50	2.51	2.60	3.47	12.25	100.00	977.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1923.83	193.06	19.98	2.67	0.94	0.77	0.75

CONTRAST RATIOS

CBS	256.10	256.41	25.64	2.56	0.26	0.03	0.00
-----	--------	--------	-------	------	------	------	------

CMB	99.92	99.23	92.76	56.18	11.36	1.27	0.13
-----	-------	-------	-------	-------	-------	------	------

SHADES OF GRAY (SG)	23.65	17.02	10.47	4.67	1.66	1.07	1.01
---------------------	-------	-------	-------	------	------	------	------

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1333.33	133.33	13.33	1.33	.13	.01
CHAX	1	99.85	9.85	0.98	0.09	0.00	0.00

SHADES OF GRAY (SG)	1	21.76	15.14	8.68	3.44	1.36	1.04
---------------------	---	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (RV)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
(FOOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BV)	I	.00	.04	.37	3.75	37.50	375.00	3750.00
(FOOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	2.50	2.54	2.87	6.25	40.00	377.50	3752.50
(FOOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	500.75	50.75	5.75	1.25	.80	.75	.75
CONTRAST RATIOS								
CABS	I	666.67	66.67	6.67	.67	.07	.01	.00
CHAX	I	99.73	97.09	76.92	25.00	3.23	.33	.03
SHADES OF GRAY (SG)	I	19.77	13.15	6.88	2.47	1.19	1.02	1.00

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 10 FOOT-LAMBERTS
 BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT
 VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I							
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	.01	.07	.75	7.50	75.00	750.00	7500.00
NET DISPLAY LUMINANCE (BD) I	2.51	2.57	3.25	10.00	77.50	752.50	7502.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA) I	250.75	25.75	3.25	1.00	.77	.75	.75

CONTRAST RATIOS

CBS I	333.33	33.33	3.33	.33	.03	.00	.00
CMAX I	99.40	9.434	62.50	14.29	1.64	.17	.02

SHADES OF GRAY (SG) I	17.77	11.20	5.23	1.83	1.09	1.01	1.00
-----------------------	-------	-------	------	------	------	------	------

IMM/S/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

BACKGROUND LUMINANCE (LB)	I	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
(FOOT-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.00	.03	.26	2.60	26.00
(FOOT-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	14.70	14.70	14.70	14.73	14.96	17.30	40.70
(FOOT-LAMBERTS)	I							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	I	11307.71	1130.79	113.10	11.33	1.15	.13	.03

CONTRAST RATIOS

CABS	I	565384.62	56538.46	5653.85	565.38	56.54	5.65	.57
------	---	-----------	----------	---------	--------	-------	------	-----

CHAX	I	100.00	100.00	99.96	99.65	96.58	73.87	22.04
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SOG)	I	39.22	32.57	25.93	19.29	12.69	6.47	2.29
----------------------	---	-------	-------	-------	-------	-------	------	------

IHWS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I							
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.00	.05	.50	5.00	50.00
(FOOT-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	14.70	14.70	14.70	14.75	15.20	19.70	64.70
(FOOT-LAMBERTS)	I							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	5880.02	588.02	58.82	5.90	.61	.08	.03

CONTRAST RATIOS

CBS	I	1294000.00	29400.00	2940.00	294.00	29.40	2.94	.29
-----	---	------------	----------	---------	--------	-------	------	-----

CMB	I	100.00	99.99	99.93	99.32	93.63	59.51	12.82
-----	---	--------	-------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	I	37.33	30.69	24.04	17.41	10.85	4.96	1.74
---------------------	---	-------	-------	-------	-------	-------	------	------

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1147000.00 14700.00 1470.00 147.00 14.70 1.47 .15

CMB 1 100.00 99.99 99.86 98.66 88.02 42.36 6.85

SHADES OF GRAY (SG) 1 35.33 28.69 22.05 15.42 8.95 3.61 1.40

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

.150R TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I							
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	.00	.00	.02	.20	2.00	20.00	200.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD) I	14.70	14.70	14.72	14.90	16.70	34.70	214.70
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	1470.02	147.02	14.72	1.49	.17	.03	.02

CONTRAST RATIOS

CBS	73500.00	7350.00	735.00	73.50	7.35	.73	.07
-----	----------	---------	--------	-------	------	-----	-----

CMB	100.00	99.97	99.73	97.35	78.61	26.87	3.54
-----	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	33.33	26.69	20.05	13.44	7.12	2.59	1.20
---------------------	-------	-------	-------	-------	------	------	------

14MS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.00	.21	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.00	.01	.05	.52	5.20	52.00
NET DISPLAY LUMINANCE (BD)	1	14.40	14.40	14.41	14.45	14.92	19.60	66.40
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	11076.96	1107.73	110.81	11.12	1.15	.15	.05

CONTRAST RATIOS

CBS 1276923.08 27692.31 2769.23 276.92 27.69 2.77 .28

CMAX 1 100.00 99.99 99.93 99.28 93.26 58.06 12.16

SHADES OF GRAY (SG) 1 37.16 30.51 23.87 17.24 10.69 4.83 1.71

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	15 F80T-LAMBERTS	4 PER CENT	25 PER CENT
BEAM SPLITTER TRANSMISSIVITY (BX)			
VISOR TRANSMISSIVITY (VX)			
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.00	0.02	0.25
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.01
NET DISPLAY LUMINANCE (BD)	14.40	14.40	14.40
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	5760:04	576:04	57.64
CONTRAST RATIOS			
CBS	144000:00	14400:00	1440:00
CHAX	100:00	99.99	99.86
SHADES OF GRAY (SOG)	35:27	28:63	21:99

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BX)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	72000.00	7200.00	720.00	72.00	7.20	.72	.07
-----	---	----------	---------	--------	-------	------	-----	-----

CMAX

1	100.00	99.97	99.72	97.30	78.26	26.47	3.47
---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)

1	33.27	26.63	19.99	13.38	7.07	2.56	1.20
---	-------	-------	-------	-------	------	------	------

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE - A57 -

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) % PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.00	0.00	0.04	0.40	4.00	40.00	400.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.04	0.40	4.00	40.00	400.00
NET DISPLAY LUMINANCE (BD)	14.40	14.40	14.44	14.80	18.40	54.40	414.40
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1440.04	144.04	14.44	1.48	0.18	0.05	0.04

CONTRAST RATIOS

CABS	36000.00	3600.00	360.00	36.00	3.60	0.36	0.04
CMAX	99.99	99.94	99.45	94.74	64.29	15.25	1.77

SHADES OF GRAY (SG)	31.27	24.63	17.99	11.42	5.40	1.89	1.10
---------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 132692.31 13269.23 1326.92 132.69 13.27 1.33 .13

CMAX 1 100.00 99.98 99.85 98.52 86.90 39.88 6.22

SHADES OF GRAY (SG) 1 35.04 28.39 21.75 15.13 8.67 3.44 1.36

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.02	.25	2.50	25.00	250.00	2500.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.02	.20	2.00	20.00	200.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	13.80	13.80	13.82	14.00	15.80	33.80	213.80
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	5520.08	552.08	55.28	5.60	.63	.14	.09

CONTRAST RATIOS

CAGS	69000.00	6900.00	690.00	69.00	6.90	.69	.07
------	----------	---------	--------	-------	------	-----	-----

CHAX	100.00	99.97	99.71	97.18	77.53	25.65	3.33
------	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	33.15	26.51	19.87	13.26	6.96	2.51	1.19
---------------------	-------	-------	-------	-------	------	------	------

IHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	0.05	0.50	5.00	50.00	500.00	5000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.04	0.40	4.00	40.00	400.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	13.80	13.80	14.20	17.80	53.80	413.80
(FOOT-LAMBERTS)							
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	1	2760.08	276.08	27.68	2.84	.36	.11
							.08

CONTRAST RATIOS

CABS 1 34500.00 3450.00 345.00 34.50 3.45 .34 .03

CHAX 1 99.99 99.94 99.42 94.52 63.30 14.71 1.70

SHADES OF GRAY (SGG) 1 31.15 24.51 17.87 11.30 5.31 1.86 1.10

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE - A61 -

IMWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAS 17250.00 1725.00 172.50 17.25 1.72 .17 .02

CHAX 99.99 99.88 98.85 89.61 46.31 7.94 .86

SHADES OF GRAY (SG) 29.15 22.51 15.88 9.38 3.89 1.46 1.05

IHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.00	.03	.32	3.25	32.50	325.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.03	.32	3.25	32.50	325.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	11.25	11.25	11.28	11.57	14.50	43.75	336.25
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	865.10	865.63	86.79	8.90	1.12	.34	.26

CONTRAST RATIOS

CABS	34615.38	3461.54	346.15	34.62	3.46	.35	.03
CMAx	99.99	99.94	99.43	94.54	63.38	14.75	1.70

SHADES OF GRAY (SG)	31.16	24.52	17.88	11.31	5.32	1.86	1.10
---------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

[illegible]

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	15 FOOT-LAMBERTS								
BEAM SPLITTER TRANSMISSIVITY (BX)	25 PER CENT								
VISOR TRANSMISSIVITY (VX)	50 PER CENT								
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L	
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (RV)	1	0.00	0.05	0.50	5.00	50.00	500.00	5000.00	
(F80T-LAMBERTS)	1								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.01	0.12	1.25	12.50	125.00	1250.00	
(F80T-LAMBERTS)	1								
NET DISPLAY LUMINANCE (BD)	1	11.25	11.26	11.37	12.50	23.75	136.25	1261.25	
(F80T-LAMBERTS)	1								
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA)	1	2250.25	225.25	22.75	2.50	0.47	0.27	0.25	

CONTRAST RATIOS

CAS	1	9000.00	900.00	90.00	9.00	.90	.09	.01
CMAX	1	99.98	99.78	97.83	81.82	31.03	4.31	.45

SHADES OF GRAY (SG)	1	27.27	23.63	14.02	7.64	2.85	1.25	1.03
---------------------	---	-------	-------	-------	------	------	------	------

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1

CONTRAST RATIOS

CABS	4500.00	450.00	45.00	4.50	.45	.04
CHAX	99.96	99.56	95.74	69.23	18.37	2.20

SHADES OF GRAY (SG)	25.27	18.63	12.05	5.92	2.07	1.13
	1.01	1.13	1.13	1.13	1.13	1.01

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	11538.46	1153.85	115.38	11.54	1.15	.12	.01
CMAX	99.98	99.83	98.30	85.23	36.59	5.45	.57

SHADES OF GRAY (SG)	1	27.99	21.35	14.73	8.30	3.21	1.32	1.03
---------------------	---	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) (FOOT-LAMBERTS)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) (FOOT-LAMBERTS)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD) (FOOT-LAMBERTS)	7.50	7.51	7.62	8.75	20.00	132.50	1257.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	3000.50	300.50	30.50	3.50	.80	.53	.50

CONTRAST RATIOS

CBS	1	6000.00	600.00	60.00	6.00	.60	.06	.01
CMAX	1	99.97	99.67	96.77	75.00	23.08	2.91	.30

SHADES OF GRAY (SG)	1	26.10	19.46	12.86	6.61	2.36	1.17	1.02
---------------------	---	-------	-------	-------	------	------	------	------

IHM5/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	15 F80T-LAMBERTS				
BEAM SPLITTER TRANSMISSIVITY (BX)	50 PER CENT				
VISOR TRANSMISSIVITY (VX)	50 PER CENT				
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.05	.50	5.00	50.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.02	.25	2.50	25.00
NET DISPLAY LUMINANCE (BD)	7.50	7.52	7.75	10.00	32.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1500:50	150:50	15:50	2:00	.65
CONTRAST RATIOS					
CABS	3000:00	300:00	30:00	3:00	.30
CMAX	99.93	99.34	93.75	60:00	13.04
SHADES OF GRAY (SG)	2:10	17:47	10:91	5:00	1:76
					1:29
					1:01

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.01	.10	1.00	10.00	100.00	1000.00	10000.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.05	.50	5.00	50.00	500.00	5000.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	7.50	7.55	8.00	12.50	57.50	507.50	5007.50
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	750.50	75.50	8.00	1.25	.57	.51	.50

CONTRAST RATIOS

CABS	1500.00	150.00	15.00	1.50	.15	.01	.00
------	---------	--------	-------	------	-----	-----	-----

CMAx	99.87	98.68	88.24	42.86	6.98	.74	.07
------	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (S8G)	22.10	15.48	9.00	3.64	1.40	1.04	1.00
----------------------	-------	-------	------	------	------	------	------

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.00	0.01	0.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.00	0.01	0.10	0.97	9.75	97.50	975.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.01	0.10	0.97	9.75	97.50	975.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	3.75	3.76	3.85	4.72	13.50	101.25	978.75
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	2885.37	289.21	29.60	3.63	1.04	.78	.75

CONTRAST RATIOS

CABS	3846.15	384.62	38.46	3.85	.38	.04	.00
------	---------	--------	-------	------	-----	-----	-----

CMAX	99.95	99.48	95.06	65.79	16.13	1.89	.19
------	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	24.82	18.18	11.60	5.55	1.94	1.11	1.01
---------------------	-------	-------	-------	------	------	------	------

JHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.02	.19	1.87	18.75	187.50	1875.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.02	.19	1.87	18.75	187.50	1875.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	3.75	3.77	3.94	5.62	22.50	191.25	1878.75
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1500.75	150.75	15.75	2.25	.90	.76	.75

CONTRAST RATIOS

CBS	2000.00	200.00	20.00	2.00	.20	.02	.00
-----	---------	--------	-------	------	-----	-----	-----

CMA	99.90	99.01	90.91	50.00	9.09	.99	.10
-----	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (SG)	22.93	16.30	9.78	4.17	1.53	1.06	1.01
---------------------	-------	-------	------	------	------	------	------

IHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	0.05	0.50	5.00	50.00	500.00	5000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.04	0.37	3.75	37.50	375.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	3.75	3.79	4.12	7.50	41.25	378.75
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	750.75	75.75	8.25	1.50	.82	.76
							.75

CONTRAST RATIOS

CBS 1 1000.00 100.00 10.00 1.00 .10 .01 .00

CHAX 1 99.80 98.04 83.33 33.33 4.76 .50 .05

SHADES OF GRAY (SG) 1 20.93 14.32 7.92 3.00 1.28 1.03 1.00

IMWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 15 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	10	100	1000	10000	100000	1000000
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	10	100	1000	10000	100000	1000000
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	10	100	1000	10000	100000	1000000
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	3.76	38.2	4.50	11.25	78.75	753.75	7503.75
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	375.75	38.25	4.50	1.12	.79	.75	.75

CONTRAST RATIOS

CBS	500.00	50.00	5.00	.50	.05	.00	.00
CMB	99.60	96.15	71.43	20.00	2.44	.25	.02

SHADES OF GRAY (SG)	18.94	12.34	6.17	2.17	1.14	1.01	1.00
---------------------	-------	-------	------	------	------	------	------

IMWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.01	0.1	1	10	100	1000
NET DISPLAY LUMINANCE (BD)	1	0.01	0.1	1	10	100	1000
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	0.01	0.1	1	10	100	1000

CONTRAST RATIOS

CBS	175384615	7538462	7538466	75385	7538	7538	7538
-----	-----------	---------	---------	-------	------	------	------

CX	1	10000	10000	9997	9974	9742	7933
----	---	-------	-------	------	------	------	------

SHADES OF GRAY (SG)	1	4005	3340	2676	2012	1351	719
---------------------	---	------	------	------	------	------	-----

2.62

I-HMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1392000.00	39200.00	3920.00	392.00	39.20	3.92	.39
-----	------------	----------	---------	--------	-------	------	-----

CMAX	1	100.00	99.99	99.95	99.89	95.15	66.22
------	---	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	38.16	31.52	24.87	18.24	11.66	5.60
---------------------	---	-------	-------	-------	-------	-------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1196000.00	19600.00	1960.00	196.00	19.60	1.96	.20
CMAX	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 98000.00 9800.00 980.00 98.00 9.80 .98 .10

CMB 1 100.00 99.98 99.80 98.00 83.05 32.89 4.67

SHADES OF GRAY (SG) 1 34.16 27.52 20.88 14.26 7.87 2.97 1.27

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) ♦ PER CENT

13 PER CENT

	I	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE (LB)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.01	.05	.52	5.20	52.00
NET DISPLAY LUMINANCE (BD)	I	19.20	19.20	19.21	19.25	19.72	20.00	71.20
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (8a)	I	1.6769.27	1.676.96	1.67.73	1.6.81	1.52	.19	.05

CONTRAST RATIOS

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) % PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (B3)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1192000.00	19200.00	1920.00	192.00	19.20	1.92	.19
-----	------------	----------	---------	--------	-------	------	-----

CMAX	1	100.00	99.99	99.90	98.97	90.57	8.76
------	---	--------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	1	36.10	29.46	22.82	16.18	9.67	4.09
---------------------	---	-------	-------	-------	-------	------	------

1.51

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	96000.00	9600.00	960.00	96.00	9.60	.96	.10
CMAX	1	100.00	99.98	99.79	97.96	82.76	32.43	4.58

SHADES OF GRAY (SG)	1	34.10	27.46	20.82	14.20	7.81	2.94	1.26
---------------------	---	-------	-------	-------	-------	------	------	------

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

20 FOOT-LAMBERTS	
4 PER CENT	
100 PER CENT	
DISPLAY LUMINANCE (LD)	
BEAM SPLITTER TRANSMISSIVITY (BX)	
VISOR TRANSMISSIVITY (VX)	
BACKGROUND LUMINANCE (LB)	0.01FT-L 0.1FT-L 1FT-L 10FT-L 100FT-L 1000FT-L 10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.01 0.10 1.00 10.00 100.00 1000.00 10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00 0.00 0.04 0.40 4.00 40.00 400.00
NET DISPLAY LUMINANCE (BD)	19.20 19.20 19.24 19.60 23.20 59.20 419.20
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1920.04 192.04 19.24 1.96 0.23 0.06 0.04
CONTRAST RATIOS	
CABS	48000.00 4800.00 480.00 48.00 4.80 0.48 0.05
CMAX	100.00 99.96 99.59 96.00 70.59 19.35 2.34
SHADES OF GRAY (SG)	32.10 25.46 18.82 12.23 6.07 2.13 1.14

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET DISPLAY LUMINANCE (BD)	18.40	18.40	18.41	18.50	19.44	26.80	122.40
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	14153.93	1415.46	141.62	14.23	1.50	.22	.09

CONTRAST RATIOS

CBS 1176923.08 17692.31 1769.23 176.92 17.69 1.77 .18

CHAX 1 100.00 99.99 99.89 99.88 99.84 99.84 99.84

SHADES OF GRAY (SG) 1 35.87 29.22 22.58 15.95 9.45 3.94 1.47

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	92000.00	9200.00	920.00	92.00	9.20	.92	.09
-----	---	----------	---------	--------	-------	------	-----	-----

C-MAX	1	100.00	99.98	99.78	97.87	82.14	31.51	4.40
-------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SGS)	1	33.98	27.34	20.69	14.08	7.70	2.88	1.25
----------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

	20 FOOT-LAMBERTS	8 PER CENT	50 PER CENT						
DISPLAY LUMINANCE (LD)									
BEAM SPLITTER TRANSMISSIVITY (BX)									
VISOR TRANSMISSIVITY (VX)									
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L	
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) (FOOT-LAMBERTS)	1	.00	.05	.50	5.00	50.00	500.00	5000.00	
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) (FOOT-LAMBERTS)	1	.00	.00	.04	.40	4.00	40.00	400.00	
NET DISPLAY LUMINANCE (BD) (FOOT-LAMBERTS)	1	18.40	18.40	18.44	18.80	22.40	58.40	418.40	
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA) (FOOT-LAMBERTS)	1	3680.08	368.08	36.88	3.76	.45	.12	.08	
CONTRAST RATIOS									
CABS	1	46000.00	4600.00	460.00	46.00	4.60	.46	.05	
CMAX	1	100.00	99.96	99.57	95.83	69.70	18.70	2.25	
SHADES OF GRAY (SOG)	1	31.98	25.34	18.70	12.11	5.97	2.09	1.13	

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.01	0.08	0.80	8.00	80.00	800.00
NET DISPLAY LUMINANCE (BD)	18.40	18.41	18.48	19.20	26.40	98.40	818.40
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1840.08	184.08	18.48	1.92	.26	.10	.08

CONTRAST RATIOS

CABS	23000.00	2300.00	230.00	23.00	2.30	.23	.02
------	----------	---------	--------	-------	------	-----	-----

CHAX

	99.99	99.91	99.14	92.00	53.49	10.31	1.14
--	-------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)

	29.98	23.34	16.70	10.17	4.44	1.60	1.07
--	-------	-------	-------	-------	------	------	------

IHM/S/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F00T-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F00T-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F00T-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CABS	1	1	1	1	1	1	1
CMAX	1	1	1	1	1	1	1

SHADES OF GRAY (SG)	1	1	1	1	1	1	1
---------------------	---	---	---	---	---	---	---

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.06	.62	6.25	62.50	625.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	15.00	15.01	15.06	15.62	21.25	77.50	640.00
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	6000.25	600.25	60.25	6.25	.85	.31	.26

CONTRAST RATIOS

CBS	24000.00	2400.00	240.00	24.00	2.40	.24	.02
-----	----------	---------	--------	-------	------	-----	-----

CMA	99.99	99.92	99.17	92.31	54.55	10.71	1.19
-----	-------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	30.10	23.46	16.83	10.29	4.53	1.62	1.07
---------------------	-------	-------	-------	-------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 12000:00 1200:00 120:00 12:00 1:20 1:12 1:01

CMB 1 99:98 99:83 98:36 85:71 37:50 5:66 1:60

SHADES OF GRAY (SG) 1 28:10 21:46 14:84 8:40 3:28 1:33 1:03

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 6000:00 600:00 60:00 6:00 6:00 6:00 6:00

CHAX 1 99:97 99:67 96:77 75:00 23:08 2:91 1:30

SHADES OF GRAY (SG) 1 26:10 19:46 12:86 6:61 2:36 1:17 1:02

IHMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.01	0.1	1	10	100	1000	10000
NET DISPLAY LUMINANCE (BD)	10.00	10.01	10.06	10.65	16.50	75.00	660.00
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	7692.81	769.73	77.42	8.13	1.27	.58	.51

CONTRAST RATIOS

CBS	15384.62	1538.46	153.85	15.38	1.54	.15	.02
C _{MAX}	99.99	99.87	98.72	88.50	43.48	7.14	.76

SHADES OF GRAY (SG)	28.82	22.18	15.55	9.07	3.69	1.41	1.04
---------------------	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS
 BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT
 VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) (FOOT-LAMBERTS)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) (FOOT-LAMBERTS)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD) (FOOT-LAMBERTS)	10.00	10.01	10.12	11.25	22.50	135.00	1260.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) (FOOT-LAMBERTS)	1000.50	100.50	10.50	1.50	.90	.54	.50

CONTRAST RATIOS

CBS	1000.00	100.00	10.00	1.00	.80	.38	.01
CMB	99.98	99.75	97.56	80.00	28.57	3.85	.40
SHADES OF GRAY (SG)	26.93	20.29	13.68	7.34	2.70	1.22	1.02

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	4000.00	400.00	40.00	4.00	.40	.04	.00
C _{MAX}	1	99.95	99.50	95.24	66.67	16.67	1.96	.20

SHADES OF GRAY (SG)	1	24.93	18.29	11.72	5.64	1.97	1.11	1.01
---------------------	---	-------	-------	-------	------	------	------	------

IHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

	2000.00	200.00	20.00	2.00	.20	.02	.00
CBS	1	1	1	1	1	1	1

	99.90	99.01	90.91	50.00	9.09	.99	.10
CMAX	1	1	1	1	1	1	1

	22.93	16.30	9.78	4.17	1.53	1.06	1.01
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

INHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAS	5128.21	512.82	51.28	5.13	.51	.05	.01
CMA	99.96	99.61	96.25	71.94	20.41	2.50	.26

SHADES OF GRAY (SG)	1	25.65	19.01	12.42	6.23	2.19	1.14	1.01
---------------------	---	-------	-------	-------	------	------	------	------

THMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1
(FOOT-LAMBERTS)						
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1
(FOOT-LAMBERTS)						
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1
(FOOT-LAMBERTS)						
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	266.67	266.67	26.67	2.67	.27	.03	.00
-----	---	--------	--------	-------	------	-----	-----	-----

CMAX	1	99.93	99.26	93.02	57.14	11.76	1.32	.13
------	---	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	1	23.76	17.13	10.58	4.75	1.68	1.08	1.01
---------------------	---	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1333.33	133.33	13.33	1.33	0.13	0.01	0.00
-----	---------	--------	-------	------	------	------	------

CMAX	99.85	98.52	86.96	40.00	6.25	0.66	0.01
------	-------	-------	-------	-------	------	------	------

SHADES OF GRAY (SG)	21.76	15.14	8.68	3.44	1.36	1.04	1.00
---------------------	-------	-------	------	------	------	------	------

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 20 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1
	500.75	50.75	5.75	1.25	.80	.75	.75

CONTRAST RATIOS

CBS	1	666.67	66.67	6.67	.67	.07	.01	.00
CMAX	1	99.70	97.09	76.92	25.00	3.23	.33	.03

SHADES OF GRAY (SG)	1	19.77	13.16	6.88	2.47	1.19	1.02	1.00
---------------------	---	-------	-------	------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.00	.03	.26	2.50	26.00
NET DISPLAY LUMINANCE (BD)	I	24.50	24.50	24.50	24.53	24.76	27.10	50.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	18846.17	1884.64	188.48	18.87	1.90	.21	.04

CONTRAST RATIOS

CBS	I	1942307.69	94230.77	9423.08	942.31	94.23	9.42	.94
-----	---	------------	----------	---------	--------	-------	------	-----

CMAX	I	100.00	100.00	99.98	99.79	97.92	82.49	32.03
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	I	40.69	34.05	27.40	20.76	14.15	7.76	2.92
---------------------	---	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1490000.00	49000.00	4900.00	490.00	49.00	4.90	.49
-----	------------	----------	---------	--------	-------	------	-----

CMAX	1	100.00	100.00	99.96	99.59	96.08	71.01	19.68
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	38.80	32.16	25.52	18.88	12.29	6.12	2.15
---------------------	---	-------	-------	-------	-------	-------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BX)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	0.01	0.1	1	10	100	1000	10000
NET DISPLAY LUMINANCE (BD)	0.01	0.1	1	10	100	1000	10000
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BR)	0.01	0.1	1	10	100	1000	10000

CONTRAST RATIOS

CAS	1245000.00	24500.00	2450.00	245.00	24.50	2.45	.24
CMAX	100.00	99.99	99.92	99.19	92.45	55.06	10.91
SHADES OF GRAY (SG)	36.80	30.16	23.52	19.89	10.34	4.57	1.63

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITH-IN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1122500.00	12250.00	1225.00	122.50	12.25	1.22	.12
CHAK	1	1	1	1	1	1	1
CHAK	1	1	1	1	1	1	1
CHAK	1	1	1	1	1	1	1

SHADES OF GRAY (SGG)	1	1	1	1	1	1	1
SHADES OF GRAY (SGG)	1	1	1	1	1	1	1
SHADES OF GRAY (SGG)	1	1	1	1	1	1	1
SHADES OF GRAY (SGG)	1	1	1	1	1	1	1

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	01	01FT-L	01FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.01	0.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
(F80T-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.01	.05	.52	5.20	52.00
(F80T-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	24.00	24.00	24.01	24.05	24.52	29.20	76.00
(F80T-LAMBERTS)	I							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	18461.58	1846.19	184.66	18.50	1.89	.22	.06

CONTRAST RATIOS

CBS	I	1461538.46	46153.85	4615.38	461.54	46.15	4.62	.46
CMAX	I	100.00	100.00	99.96	99.57	95.85	69.77	18.75

SHADES OF GRAY (SG)	I	38.63	31.99	25.35	18.71	12.12	5.98	2.09
---------------------	---	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

25 FOOT-LAMBERTS								
4 PER CENT								
25 PER CENT								
DISPLAY LUMINANCE (LD)	25 FOOT-LAMBERTS							
BKGM SPLITTER TRANSMISSIVITY (BX)	4 PER CENT							
VISOR TRANSMISSIONITY (VX)	25 PER CENT							

BACKGROUND LUMINANCE (LB)	I	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(RV)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB)	I	.00	.01	.10	1.00	10.00	100.00	1000.00
(FOOT-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	24.00	24.00	24.01	24.10	25.00	34.00	124.00
(FOOT-LAMBERTS)	I							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	9600.04	960.04	96.04	9.64	1.00	.14	.05

CONTRAST RATIOS								
CBS	I	1240000.00	24000.00	2400.00	240.00	24.00	2.40	.24
CMAX	I	100.00	99.99	99.92	99.17	92.31	54.55	10.71

SHADES OF GRAY (SGG)	I	36.75	30.10	23.46	16.83	10.29	4.53	1.62

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

[illegible]

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE - A105 -

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) I	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET DISPLAY LUMINANCE (BD) I	24.00	24.00	24.04	24.40	28.00	64.00	424.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	2400.04	240.04	24.04	2.44	.28	.06	.04

CONTRAST RATIOS

CBS	60000.00	6000.00	600.00	60.00	6.00	.60	.06
CMB	100.00	99.97	99.67	96.77	75.00	23.08	2.91

SHADES OF GRAY (SG) I	32.75	26.10	19.46	12.86	6.61	2.36	1.17
-----------------------	-------	-------	-------	-------	------	------	------

INMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	0.00	0.01	0.1	1.0	10.0	100.0	1000.0
(FOOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	0.00	0.01	0.1	1.0	10.0	100.0	1000.0
(FOOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	23.00	23.00	23.01	23.10	24.04	33.40	127.00
(FOOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	I	17692.39	1769.31	177.00	17.77	1.85	0.26	0.10

CONTRAST RATIOS

CABS	I	1221153.85	22115.38	2211.54	221.15	22.12	2.21	0.22
------	---	------------	----------	---------	--------	-------	------	------

CMAV	I	100.00	99.99	99.91	99.10	91.71	52.51	9.96
------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SGG)	I	36.51	29.87	23.22	16.59	10.06	4.37	1.58
----------------------	---	-------	-------	-------	-------	-------	------	------

JHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 115000.00 11500.00 1150.00 115.00 11.50 1.15 .11

CMAX 1 100.00 99.98 99.83 98.29 85.19 36.51 5.44

SHADES OF GRAY (SG) 1 34.62 27.98 21.34 14.72 8.29 3.21 1.31

IHWS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (RV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 57500.00 5750.00 575.00 57.50 5.75 .57 .06

CMAX 1 100.00 99.97 99.65 96.64 74.19 22.33 2.79

SHADES OF GRAY (SG) 1 32.62 25.98 19.34 12.74 6.51 2.31 1.16

IHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (9A)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAGS 1 28750.00 2875.00 287.50 28.75 2.87 .29 .03

CMAX 1 99.99 99.93 99.31 93.50 58.97 12.57 1.42

SHADES OF GRAY (SG) 1 30.62 23.98 17.34 10.79 4.91 1.73 1.08

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01-FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	18.75	18.75	18.78	19.07	22.00	51.25	343.75
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
	14423.33	1442.56	144.48	14.67	1.69	.39	.26

CONTRAST RATIOS

CBS	57692.31	5769.23	576.92	57.69	5.77	.58	.06
-----	----------	---------	--------	-------	------	-----	-----

CMB	100.00	99.97	99.65	96.65	74.26	22.39	2.80
-----	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	1	32.63	25.99	19.35	12.75	6.52	2.31	1.16
---------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
(F90T-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.01	.06	.62	6.25	62.50	625.00
(F90T-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	18.75	18.76	18.81	19.37	25.00	81.25	643.75
(F90T-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	7500.25	750.25	75.25	7.75	1.00	.32	.26

CONTRAST RATIOS

CBS	I	30000.00	3000.00	300.00	30.00	3.00	.30	.03
-----	---	----------	---------	--------	-------	------	-----	-----

CMBX I I

	I	99.99	99.93	99.34	93.75	60.00	13.04	1.48
--	---	-------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	I	30.75	24.10	17.47	13.91	5.00	1.76	1.09
---------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.01	.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD)	I	18.75	18.76	18.87	20.00	31.25	143.75	1268.75
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	3750.25	375.25	37.75	4.00	.62	.29	.25

CONTRAST RATIOS

CBS	I	15000.00	1500.00	150.00	15.00	1.50	.15	.01
CMB	I	99.99	99.87	98.68	88.24	42.86	6.98	.74
SHADES OF GRAY (SG)	I	28.75	22.10	15.48	9.00	3.64	1.40	1.04

JHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

	7500:00	750:00	75:00	7:50	.75	.07	.01
CBS	1	1	1	1	1	1	1
CMA	1	1	1	1	1	1	1

SHADES OF GRAY (SOG)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
----------------------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

14MS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 F8BT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.01	.13	1.30	13.00	130.00
(F8BT-LAMBERTS)						
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.06	.65	6.50	65.00
(F8BT-LAMBERTS)						
NET DISPLAY LUMINANCE (BD)	12.50	12.51	12.56	13.15	19.00	77.50
(F8BT-LAMBERTS)						
INTER-SOLAR LUMINANCE DIFFERENCE RATIO (BA)	9615.88	962.04	96.65	10.12	1.46	.60

CONTRAST RATIOS

CAS	19230.77	1923.08	192.31	19.23	1.92	.19
-----	----------	---------	--------	-------	------	-----

CMA

	99.99	99.90	98.97	90.58	49.02	8.77
--	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	29.46	22.82	16.19	9.68	4.08	1.61
---------------------	-------	-------	-------	------	------	------

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV) I	.00	.01	.12	1.25	12.50	125.00	1250.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	.00	.01	.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD) I	12.50	12.51	12.62	13.75	25.00	137.50	1262.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	5000.50	500.50	50.50	5.50	1.00	.55	.50

CONTRAST RATIOS

CABS I	10000.00	1000.00	100.00	10.00	1.00	.10	.01
CHAX I	99.98	99.80	98.04	83.33	33.33	4.76	.50

SHADES OF GRAY (SG) I	27.58	20.93	14.32	7.92	3.00	1.28	1.03
-----------------------	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	12.50	12.52	12.75	15.00	37.50	262.50	2512.50
(FOOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	I	2500.50	250.50	25.50	3.00	.75	.52	.50

CONTRAST RATIOS

CABS	I	5000.00	500.00	50.00	5.00	.50	.35	.00
CMAX	I	99.96	99.60	96.15	71.43	20.00	2.44	.25

SHADES OF GRAY (SG)	I	25.58	18.94	12.34	6.17	2.17	1.14	1.01
---------------------	---	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.05	.50	5.00	50.00	500.00	5000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	12.50	12.55	13.00	17.50	62.50	512.50	5012.50
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1250.50	125.50	13.00	1.75	.62	.51	.50
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (R)							

CONTRAST RATIOS

CBS	2500.00	250.00	25.00	2.50	.25	.02	.00
CMAX	99.92	99.21	92.59	55.56	11.11	1.23	.12

SHADES OF GRAY (SG)	23.58	16.94	10.40	4.61	1.64	1.07	1.01
---------------------	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	6410.26	641.03	64.10	6.41	.64	.06	.01
-----	---------	--------	-------	------	-----	-----	-----

CMB	99.97	99.69	96.97	76.22	24.27	3.11	.32
-----	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	1	26.29	19.65	13.05	6.78	2.43	1.18
							1.02

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	25 FOOT-LAMBERTS					
B E A M S P L I T T E R T R A N S M I S S I V I T Y (BX)	75 PER CENT					
VISOR TRANSMISSIVITY (VX)	25 PER CENT					
<hr/>						
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	L10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(BV) (F80T-LAMBERTS)	.00	.02	.25	2.50	25.00	250.00 2500.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB) (F80T-LAMBERTS)	.00	.02	.19	1.87	18.75	187.50 1875.00
NET DISPLAY LUMINANCE (BD) (F80T-LAMBERTS)	6.25	6.27	6.44	8.12	25.00	193.75 1881.25
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	2500.75	250.75	25.75	3.25	1.00	.77 .75
<hr/>						
CONTRAST RATIOS						
CABS	3333.33	333.33	33.33	3.33	.33	.03 .00
<hr/>						
CMAX	99.94	99.40	94.34	62.50	14.29	1.64 .17
<hr/>						
S H A D E S O F G R A Y (SGG)	25.41	17.77	11.20	5.23	1.83	1.09 1.01
<hr/>						

IHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX)

75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE BUTSIDE BEAMSPLITTER (BV)	1	.00	.05	.50	5.00	50.00	500.00	5000.00
(F80T-LAMBERTS)	1							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.04	.37	3.75	37.50	375.00	3750.00
(F80T-LAMBERTS)	1							
NET DISPLAY LUMINANCE (BD)	1	6.25	6.29	6.62	10.00	43.75	381.25	3756.25
(F80T-LAMBERTS)	1							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1250.75	125.75	13.25	2.00	.87	.76	.75

CONTRAST RATIOS

CBS	1	1666.67	166.67	16.67	1.67	.17	.02	.00
-----	---	---------	--------	-------	------	-----	-----	-----

CMA

1	99.88	98.81	89.29	45.45	7.69	.83	.03
---	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (SG)	1	22.41	15.78	9.29	3.83	1.44	1.05	1.00
---------------------	---	-------	-------	------	------	------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 25 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 833.33 83.33 8.33 .83 .08 .01 .00

CMS 1 99.76 97.66 80.65 29.41 4.00 .41 .04

SHADES OF GRAY (SG) 1 20.41 13.80 7.44 2.75 1.23 1.02 1.00

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	I	I	I	I	I	I
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	I	I	I	I	I	I
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	I	I	I	I	I	I
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	I	I	I	I	I	I	I
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	I	I	I	I	I	I
CONTRAST RATIOS							
CBS	1884615.38	188461.54	18846.15	1884.62	188.46	18.85	1.88

CMA I 100.00 100.00 99.99 99.89 98.95 90.41 48.51

SHADES OF GRAY (SG) I 42.69 36.05 29.40 22.76 16.13 9.62 4.06

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F00T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1980000*00	98000*00	9800*00	980*00	98*00	9*80	*98
-----	------------	----------	---------	--------	-------	------	-----

CMA	1	100*00	100*00	99*98	99*80	98*00	83*05	32*89
-----	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	40*80	34*16	27*52	20*88	14*26	7*87	2*97
---------------------	---	-------	-------	-------	-------	-------	------	------

IMPS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE (LB)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.00	.01	.10	1.00	10.00	100.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.01	.10	1.00	10.00	100.00
NET DISPLAY LUMINANCE (BD)	I	49.00	49.00	49.01	49.10	50.00	59.00	149.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	9800.02	980.02	98.02	9.82	1.00	.12	.03

CONTRAST RATIOS

CABS	I	1490000.00	49000.00	4900.00	490.00	49.00	4.90	.49
CMAX	I	100.00	100.00	99.96	99.59	96.08	71.01	19.68

SHADES OF GRAY (SOG)	I	38.80	32.16	25.52	18.88	12.29	6.12	2.15
----------------------	---	-------	-------	-------	-------	-------	------	------

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I							
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.02	.20	2.00	20.00	200.00
NET DISPLAY LUMINANCE (BD)	I	.49.00	.49.00	.49.02	.49.20	.51.00	.69.00	.249.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	.4900.02	.490.02	.49.02	.4.92	.51	.57	.52

CONTRAST RATIOS

CBS	I	1245000.00	24500.00	2450.00	245.00	24.50	2.45	.24
-----	---	------------	----------	---------	--------	-------	------	-----

CMS	I	100.00	99.99	99.92	99.19	92.45	55.06	10.91
-----	---	--------	-------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	I	36.80	30.16	23.52	16.89	10.34	4.57	1.63
---------------------	---	-------	-------	-------	-------	-------	------	------

THMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I							
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
(F80T-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.01	.05	.52	5.20	52.00
(F80T-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	48.00	48.00	48.01	48.05	48.52	53.20	100.00
(F80T-LAMBERTS)	I							
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	36923.12	3692.35	369.27	36.96	3.73	.41	.08

CONTRAST RATIOS

CABS 1923076.92 92307.69 9230.77 923.08 92.31 9.23 .92

CMAX I 100.00 100.00 99.98 99.78 97.88 82.19 31.58

SHADES OF GRAY (SGG) I 40.63 33.99 27.34 20.70 14.09 7.71 2.89

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	100	102	125	250	2500	25000
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	100	100	101	100	1000	10000
NET DISPLAY LUMINANCE (BD)	1	100	100	101	100	1000	10000
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA)	1	1200004	120004	12004	1204	124	23

CONTRAST RATIOS

CBS	140000000	48000000	480000	48000	4800	480	48
CMA	1	10000	10000	9996	9959	9600	7059
							1935

SHADES OF GRAY (SG)	1	38.75	32.10	25.46	18.82	12.23	6.07	2.13
---------------------	---	-------	-------	-------	-------	-------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1240000.00	24000.00	2400.00	240.00	24.00	2.40	.24
CMAX	1	100.00	99.99	99.92	99.17	92.31	54.55
	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	36.75	30.10	23.46	16.83	10.29	4.53
	1	1	1	1	1	1	1

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) % PER CENT

.158R TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAS	120000.00	12000.00	1200.00	120.00	12.00	1.20	.12
-----	-----------	----------	---------	--------	-------	------	-----

CHAX

100.00	99.98	99.83	98.36	85.71	37.50	5.66
--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)

34.75	28.10	21.46	14.84	8.40	3.29	1.33
-------	-------	-------	-------	------	------	------

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1	1	1	1	1	1
CMB	1	1	1	1	1	1	1
CMB	1	1	1	1	1	1	1

SHADES OF GRAY (SG)	1	1	1	1	1	1	1
---------------------	---	---	---	---	---	---	---

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1230000.00	23000.00	2300.00	230.00	23.00	2.30	.23
CHAX	1	100.00	99.99	99.91	99.14	92.00	53.49
	1						10.31

SHADES OF GRAY (SG)	1	36.62	29.98	23.34	16.70	10.17	4.44
	1						1.60

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	115000.00	11500.00	1150.00	115.00	11.50	1.15	.11
-----	-----------	----------	---------	--------	-------	------	-----

CMAX	1	100.00	99.98	99.83	98.29	85.19	36.51	5.44
------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	1	34.62	27.98	21.34	14.72	8.29	3.21	1.31
---------------------	---	-------	-------	-------	-------	------	------	------

JHMS/2 DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 57500.00 5750.00 575.00 57.50 5.75 .57 .06

CMAX 1 100.00 99.97 99.65 96.64 74.19 22.33 2.79

SHADES OF GRAY (SOG) 1 32.62 25.98 19.34 12.74 6.51 2.31 1.16

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

50 FOOT-LAMBERTS	25 PER CENT	13 PER CENT	100 FT-L	100 FT-L	100 FT-L	100 FT-L	100 FT-L	100 FT-L	100 FT-L
DISPLAY LUMINANCE (LD)	BEAM SPLITTER TRANSMISSIVITY (BX)	VISOR TRANSMISSIVITY (VX)	BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
			NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BY)	.00	.01	.13	1.30	13.00	130.00
			NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.03	.32	3.25	32.50
			NET DISPLAY LUMINANCE (BD)	37.50	37.50	37.53	37.82	40.75	70.00
			INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	28846.40	2884.87	288.71	29.10	3.13	.54
CONTRAST RATIOS									
			CAS	115384.62	11538.46	1153.85	115.38	11.54	1.15
			CMAX	100.00	99.98	99.83	98.30	85.23	36.59
			SHADES OF GRAY (SG)	34.63	27.99	21.35	14.73	8.30	3.21

IMM/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.01	.06	.62	6.25	62.50	625.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.06	.62	6.25	62.50	625.00
NET DISPLAY LUMINANCE (BD)	37.50	37.51	37.56	38.12	43.75	100.00	662.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	15000.25	1500.25	150.25	15.25	1.75	.40	.26

CONTRAST RATIOS

CBS	60000.00	6000.00	600.00	60.00	6.00	.60	.06
CHAX	100.00	99.97	99.67	96.77	75.00	23.08	2.91

SHADES OF GRAY (SG)	32.75	26.10	19.46	12.86	6.61	2.36	1.17
---------------------	-------	-------	-------	-------	------	------	------

1HMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-ocular LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1
CONTRAST RATIOS							
CBS	30000.00	3000.00	300.00	30.00	3.00	.30	.03
CMAX	99.99	99.93	99.34	93.75	60.00	13.04	1.48
SHADES OF GRAY (SG)	30.75	24.10	17.47	10.91	5.00	1.76	1.09

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
(F80T-LAMBERTS)	1	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
(F80T-LAMBERTS)	1	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET DISPLAY LUMINANCE (BD)	1	37.50	37.52	37.75	40.00	62.50	287.50	2537.50
(F80T-LAMBERTS)	1	37.50	37.52	37.75	40.00	62.50	287.50	2537.50
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	3750.25	375.25	37.75	4.00	.62	.29	.25

CONTRAST RATIOS

CBS	1	15000.00	1500.00	150.00	15.00	1.50	.15	.01
CMB	1	99.99	99.87	98.68	88.24	42.86	6.98	.74

SHADES OF GRAY (SG)	1	28.75	22.10	15.48	9.00	3.64	1.40	1.04
---------------------	---	-------	-------	-------	------	------	------	------

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

ISSR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 38461.54 3846.15 384.62 38.46 3.85 .38 .04

CMAX 99.99 99.95 99.48 95.06 65.79 16.13 1.89

SHADES OF GRAY (SG) 31.46 24.82 18.18 11.60 5.55 1.94 1.11

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE - A139 -

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) (FOOT-LAMBERTS)	.00	.01	.12	1.25	12.50	125.00	1250.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) (FOOT-LAMBERTS)	25.00	25.01	25.12	26.25	37.50	150.00	1275.00
NET DISPLAY LUMINANCE (BD) (FOOT-LAMBERTS)	10000.50	1000.50	100.50	10.50	1.50	.60	.51
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (Ra)							

CONTRAST RATIOS

CABS	20000.00	2000.00	200.00	20.00	2.00	.20	.02
------	----------	---------	--------	-------	------	-----	-----

CHAX	99.99	99.90	99.01	90.91	50.00	9.09	.99
------	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (Sg)	29.58	22.93	16.30	9.78	4.17	1.53	.06
---------------------	-------	-------	-------	------	------	------	-----

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CABS	10000.00	1000.00	100.00	10.00	1.00	.10	.01
CMAX	99.98	99.80	98.04	83.33	33.33	4.76	.50

SHADES OF GRAY (SG)	27.58	20.93	14.32	7.92	3.00	1.28	1.03
---------------------	-------	-------	-------	------	------	------	------

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 5000.00 500.00 50.00 5.00 .50 .05 .00

CMAX 1 99.96 99.60 96.15 71.43 20.00 2.44 .25

SHADES OF GRAY (SG) 1 25.58 18.94 12.34 6.17 2.17 1.14 1.01

IHMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

159R TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)							
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.10	.97	9.75	97.50	975.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	12.50	12.51	12.60	13.47	22.25	110.00	987.50
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	9616.13	962.29	96.90	10.37	1.71	.85	.76

CONTRAST RATIOS

CBS	12820.51	1282.05	128.21	12.82	1.28	.13	.01
CMA	99.98	99.84	98.46	86.51	39.06	6.22	.64

SHADES OF GRAY (SG)	28.29	21.65	15.03	8.58	3.38	1.35	1.04
---------------------	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	6666.67	666.67	66.67	6.67	.67	.07	.01
-----	---------	--------	-------	------	-----	-----	-----

CMAX	99.97	99.70	97.09	76.92	25.00	3.23	.33
------	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SG)	26.41	19.77	13.16	6.88	2.47	1.19	1.02
---------------------	-------	-------	-------	------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I	.00	.05	.50	5.00	50.00	500.00	5000.00
(F887-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS) I	.00	.04	.37	3.75	37.50	375.00	3750.00
(F887-LAMBERTS)							
NET DISPLAY LUMINANCE (BD) I	12.50	12.54	12.87	16.25	50.00	387.50	3762.50
(F887-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	2500.75	250.75	25.75	3.25	1.00	.77	.75

CONTRAST RATIOS

CABS I 3333.33 333.33 33.33 3.33 .33 .03 .00

CMAX I 99.94 99.40 94.34 62.50 14.29 1.64 .17

SHADES OF GRAY (SG) I 24.41 17.77 11.20 5.23 1.83 1.09 1.01

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 50 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CABS	1	1666.67	166.67	16.67	1.67	.17	.02	.00
------	---	---------	--------	-------	------	-----	-----	-----

CMAX	1	99.88	98.81	89.29	45.45	7.69	.83	.08
------	---	-------	-------	-------	-------	------	-----	-----

SHADES OF GRAY (SG)	1	22.41	15.78	9.29	3.83	1.44	1.05	1.00
---------------------	---	-------	-------	------	------	------	------	------

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
	7538.64	7538.48	753.87	75.40	7.56	.77	.10

CONTRAST RATIOS

CBS 1769230.77376923.08 37692.31 3769.23 376.92 37.69 3.77

CMAX 1 100.00 100.00 99.99 99.95 99.47 94.96 65.33

SHADES OF GRAY (SG) 1 44.69 38.05 31.40 24.76 18.12 11.55 5.51

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1960000.001960000.00 19600.00 1960.00 196.00 19.60 1.96

CMBX 1 1

SHADES OF GRAY (SG) 1 42.80 36.16 29.52 22.87 16.24 9.73 4.13

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
	19600.02	1960.02	196.02	19.62	1.98	.22	.04

CONTRAST RATIOS

CBS	198000.00	98000.00	9800.00	980.00	98.00	9.80	.98
-----	-----------	----------	---------	--------	-------	------	-----

CMB	1	100.00	100.00	99.98	99.80	98.00	83.15	32.89
-----	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	40.80	34.16	27.52	20.88	14.26	7.87	2.97
---------------------	---	-------	-------	-------	-------	-------	------	------

INHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAS	1490000.00	49000.00	4900.00	490.00	49.00	4.90	.49
-----	------------	----------	---------	--------	-------	------	-----

CMA	1	100.00	100.00	99.96	99.59	96.08	71.01
-----	---	--------	--------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	38.80	32.16	25.52	18.88	12.29	6.12
---------------------	---	-------	-------	-------	-------	-------	------

2.15

IHMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	I	I	I	I	I	I
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.00	.01	.05	.52	5.20
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	I	96.00	96.00	96.01	96.05	96.52	101.20
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	I	73846.19	7384.66	738.50	73.89	7.42	.78
							.11

CONTRAST RATIOS

CBS 1846153.85184615.38 18461.54 1846.15 184.62 18.46 1.85

CMAX I 100.00 100.00 99.99 99.89 98.93 90.23 48.00

SHADES OF GRAY (SOG) I 42.63 35.99 29.34 22.70 16.07 9.57 4.02

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1960000.00	96000.00	9600.00	960.00	96.00	9.60	.96
CMAX	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

IHM/S/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CABS	1480000.00	48000.00	4800.00	480.00	48.00	4.80	.48
------	------------	----------	---------	--------	-------	------	-----

CMAX	1	100.00	100.00	99.96	99.59	96.00	70.59	19.35
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	38.75	32.10	25.46	18.82	12.23	6.07	2.13
---------------------	---	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

[illegible]

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.13	1.30	13.00	130.00	1300.00	
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.00	0.01	0.10	1.04	10.40	104.00	
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.00	0.01	0.10	1.04	10.40	104.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	92.00	92.00	92.01	92.10	93.04	102.40	196.00
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (B*)	70769.31	7077.00	707.77	70.85	7.16	.79	.15

CONTRAST RATIOS

CBS	1884615.38	88461.54	8846.15	884.62	88.46	8.85	.88
CMAX	100.00	100.00	99.98	99.77	97.79	81.56	30.67
SHADES OF GRAY (SG)	40.51	33.87	27.22	20.58	13.97	7.60	2.83

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1460000.00	46000.00	4600.00	460.00	46.00	4.60	.46
-----	------------	----------	---------	--------	-------	------	-----

CMB

CMB	100.00	100.00	99.96	99.57	95.83	69.70	18.70
-----	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	38.62	31.98	25.34	18.70	12.11	5.97
---------------------	---	-------	-------	-------	-------	-------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

[illegible]

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE - A157 -

JMW/S/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 115000.00 11500.00 1150.00 115.00 11.50 1.15 .11

CMAX 1 100.00 99.98 99.83 98.29 85.19 36.51 5.44

SHADES OF GRAY (SG) 1 34.62 27.98 21.34 14.72 8.29 3.21 1.31

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	I	I	I	I	I	I
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.01	.13	1.30	13.00	130.00	1300.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.03	.32	3.25	32.50	325.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	I	75.00	75.03	75.32	78.25	107.50	400.00
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	57692.56	577.17	57.94	6.02	.83	.31

CONTRAST RATIOS

CBS	1230769.23	23076.92	2307.69	230.77	23.08	2.31	.23
-----	------------	----------	---------	--------	-------	------	-----

CMA	I	100.00	99.99	99.91	99.14	92.02	53.57	10.34
-----	---	--------	-------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	I	36.63	29.99	23.35	16.71	10.18	4.45	1.60
---------------------	---	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

100 FOOT-LAMBERTS								
25 PER CENT								
25 PER CENT								
0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1	1	1	1	1	1	1		
1								

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	60000.00	6000.00	600.00	60.00	6.00	.60	.06
CMAX	1	100.00	99.97	99.67	96.77	75.00	23.08	2.91

SHADES OF GRAY (SG)	1	32.75	26.10	19.46	12.86	6.61	2.36	1.17
---------------------	---	-------	-------	-------	-------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BY)	0.01	0.10	1.00	10.00	100.00	1000.00	10000.00
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.02	0.25	2.50	25.00	250.00	2500.00
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	75.00	75.02	75.25	77.50	100.00	325.00	2575.00
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	7500.25	750.25	75.25	7.75	1.00	.32	.26

CONTRAST RATIOS

CBS	30000.00	3000.00	300.00	30.00	3.00	.30	.03
-----	----------	---------	--------	-------	------	-----	-----

CMA

1.48

SHADES OF GRAY (SG)	30.75	20.10	17.47	10.31	5.00	1.76	1.09
---------------------	-------	-------	-------	-------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	0.01	0.1	1	10	100	1000	10000
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.01	0.1	1	10	100	1000	10000
NET DISPLAY LUMINANCE (BD)	50.00	50.01	50.06	50.65	56.50	115.00	700.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	3846.04	3846.65	385.12	38.96	4.35	.88	.54

CONTRAST RATIOS

CBS 176923.08 7692.31 769.23 76.92 7.69 .77 .08

CMB 100.00 99.97 99.74 97.47 79.37 27.78 3.70

SHADES OF GRAY (SG) 1 33.46 26.82 20.18 13.57 7.24 2.65 1.21

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 F00T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.02	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	0.00	0.01	0.12	1.25	12.50	125.00	1250.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.00	0.01	0.12	1.25	12.50	125.00	1250.00
NET DISPLAY LUMINANCE (BD)	1	50.00	50.01	50.12	51.25	62.50	175.00	1300.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	2000.50	200.50	20.50	2.50	2.50	.70	.52

CONTRAST RATIOS

CAS 1 40000.00 4000.00 400.00 40.00 4.00 .40 .04

CMAX 1 100.00 99.95 99.50 95.24 66.67 16.67 1.96

SHADES OF GRAY (SG) 1 31.58 24.93 18.29 11.72 5.64 1.97 1.11

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	20000.00	2000.00	200.00	20.00	2.00	.20	.02
CHAX	1	99.99	99.90	99.01	90.91	50.00	9.09	.99

SHADES OF GRAY (SG)	1	29.58	22.93	16.30	9.78	4.17	1.53	1.06
---------------------	---	-------	-------	-------	------	------	------	------

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE -A165-

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 10000.00 1000.00 100.00 10.00 1.00 .10 .01

CMAX 1 99.98 99.80 98.04 83.33 33.33 4.76 .50

SHADES OF GRAY (SGG) 1 27.58 20.93 14.32 7.92 3.00 1.28 1.03

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.1	1.0	10.0	100.0	1000.0	10000.0
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.01	0.1	1.0	10.0	100.0	1000.0	10000.0
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.01	0.1	1.0	10.0	100.0	1000.0	10000.0
NET DISPLAY LUMINANCE (BD)	25.00	25.01	25.10	25.97	34.75	122.50	1000.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	19231.52	1923.83	193.06	19.98	2.67	.94	.77

CONTRAST RATIOS

CBS	25641.03	2564.10	256.41	25.64	2.56	.26	.03
CMB	99.99	99.92	99.23	92.76	56.18	11.36	1.27

SHADES OF GRAY (SG)	30.29	23.65	17.02	10.47	4.67	1.66	1.07
---------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.00	.02	.25	2.50	25.00	250.00	2500.00
(F80T-LAMBERTS)	1							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.02	.19	1.87	18.75	187.50	1875.00
(F80T-LAMBERTS)	1							
NET DISPLAY LUMINANCE (BD)	1	25.00	25.02	25.19	26.87	43.75	212.50	1900.00
(F80T-LAMBERTS)	1							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	10000.75	1000.75	100.75	10.75	1.75	.85	.76
CONTRAST RATIOS								
CABS	1	13333.33	1333.33	133.33	13.33	1.33	.13	.01

CMAX 1 99.99 99.85 98.52 86.96 40.00 6.25 .66

	1	25.41	21.76	15.14	8.68	3.44	1.36	1.04
SHADES OF GRAY (SOG)	1	25.41	21.76	15.14	8.68	3.44	1.36	1.04

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.04	.37	3.75	37.50	375.00	3750.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.04	.37	3.75	37.50	375.00	3750.00
NET DISPLAY LUMINANCE (BD)	25.00	25.04	25.37	28.75	62.50	400.00	3775.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BΔ)	5000.75	500.75	50.75	5.75	1.25	.80	.75

CONTRAST RATIOS

CBS	6666.67	666.67	66.67	6.67	.67	.07	.01
CMB	99.97	99.70	97.09	76.92	25.00	3.23	.33

SHADES OF GRAY (SOG)	26.41	19.77	13.16	6.88	2.47	1.19	1.02
----------------------	-------	-------	-------	------	------	------	------

IMMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 100 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CAS	3333.33	333.33	33.33	3.33	0.33	0.03	0.00
CHAX	99.94	99.40	94.34	62.50	14.29	1.64	0.17
SHADES OF GRAY (SG)	24.41	17.77	11.20	5.23	1.83	1.09	1.01

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISER TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (SB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	150769.25	15076.94	1507.71	150.79	15.10	1.53	.17

CONTRAST RATIOS

CABS	1538461.54753846.15	75384.62	7538.46	753.85	75.38	7.54	
------	---------------------	----------	---------	--------	-------	------	--

CMAX	1	100.00	100.00	100.00	99.97	99.74	97.42
------	---	--------	--------	--------	-------	-------	-------

SHADES OF GRAY (SOG)	1	46.69	40.05	33.40	26.76	20.12	13.51
----------------------	---	-------	-------	-------	-------	-------	-------

7.19

DISPLAY LUMINANCE AND CONTRAST

DATE 12 APR 1973 PAGE -A171-

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

BEAM SPLITTER TRANSMISSIVITY (BX)	2 PER CENT	203 FOOT-LAMBERTS	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
VISOR TRANSMISSIVITY (VX)	25 PER CENT						
BACKGROUND LUMINANCE (LB)	0.01FT-L 0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L	
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.00	.05	.50	5.00	50.00
NET DISPLAY LUMINANCE (BD)	196.00	196.00	196.00	196.05	196.50	201.00	246.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	178400.02	7840.02	784.02	78.42	7.86	.80	.10
CONTRAST RATIOS							
CBS	1920000.00	392000.00	39200.00	3920.00	392.00	39.20	3.92
CAX	100.00	100.00	99.99	99.95	99.49	95.15	66.22
SHADES OF GRAY (SG)	44.80	38.16	31.52	24.87	18.24	11.66	5.60

INMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (B ₀)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1960000*00196000*00	19600*00	19600*00	1960*00	196*00	19*60	1*96
C _{MAX}	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)							
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.01	.10	1.00	10.00	100.00	1000.00	10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.02	.20	2.00	20.00	200.00
NET DISPLAY LUMINANCE (BD)	196.00	196.00	196.02	196.20	198.00	216.00	396.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	19600.02	1960.02	196.02	19.62	1.98	.22	.04

CONTRAST RATIOS

CBS	1980000.00	98000.00	9800.00	980.00	98.00	9.80	.98
C _{MAX}	100.00	100.00	99.98	99.80	98.00	83.05	32.89

SHADES OF GRAY (SG)	40.80	34.16	27.52	20.88	14.26	7.87	2.97
---------------------	-------	-------	-------	-------	-------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1692307.69369230.77 36923.08 3692.31 369.23 36.92 3.69

CMS 1 100.00 100.00 99.99 99.95 99.46 94.86 64.86

SHADES OF GRAY (SG) 1 44.63 37.99 31.34 24.70 18.06 11.49 5.46

THMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) % PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.00	0.02	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	0.00	0.00	0.01	0.10	1.00	10.00	100.00
(FOOT-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	192.00	192.00	192.01	192.10	193.00	202.00	292.00
(FOOT-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	1	192.00	192.00	192.01	192.10	193.00	202.00	292.00
(FOOT-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	76800.00	7680.00	768.00	76.80	7.72	.81	.12

CONTRAST RATIOS

CBS	192000.00	19200.00	1920.00	192.00	19.20	1.92
-----	-----------	----------	---------	--------	-------	------

CMB	1	100.00	100.00	99.99	99.90	98.97	90.57	48.98
-----	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	42.75	36.10	29.46	22.82	16.18	9.67	4.09
---------------------	---	-------	-------	-------	-------	-------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FBFT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FBFT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	192.00	192.00	192.02	192.20	194.00	212.00	392.00
(FBFT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	38400.04	3840.04	384.04	38.44	3.88	.42	.08

CONTRAST RATIOS

CAS	1960000.00	96000.00	9600.00	960.00	96.00	9.60	.96
-----	------------	----------	---------	--------	-------	------	-----

CMAx	1	100.00	100.00	99.98	99.79	97.96	82.76	32.43
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	40.75	34.10	27.46	20.82	14.20	7.81	2.94
---------------------	---	-------	-------	-------	-------	-------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) % PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	1	1	1	1	1	1
CMAX	1	1	1	1	1	1	1
SHADES OF GRAY (SGS)	1	1	1	1	1	1	1

IMPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.01	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (RB)	.00	.00	.01	.10	1.04	10.40	104.00
NET DISPLAY LUMINANCE (BD)	184.00	184.00	184.01	184.10	185.04	194.40	288.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	141538.54	14153.93	1415.46	141.62	14.23	1.50	.22

CONTRAST RATIOS

CAS	1769230.77	176923.08	17692.31	1769.23	176.92	17.69	1.77
-----	------------	-----------	----------	---------	--------	-------	------

CMA	1	100.00	100.00	99.99	99.89	98.88	89.84	46.94
-----	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	42.51	35.87	29.22	22.58	15.95	9.45	3.94
---------------------	---	-------	-------	-------	-------	-------	------	------

INMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 3 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.01	0.02	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	0.01	0.02	0.25	2.50	25.00	250.00	2500.00
(F90T-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	0.01	0.02	0.25	2.50	25.00	250.00	2500.00
(F90T-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	184.00	184.00	184.02	184.20	186.00	204.00	384.00
(F90T-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	73600.08	7360.08	736.08	73.68	7.44	.82	.15

CONTRAST RATIOS

CBS	I	1920000.00	92000.00	9200.00	920.00	92.00	9.20	.92
-----	---	------------	----------	---------	--------	-------	------	-----

CHAX	I	100.00	100.00	99.98	99.78	97.87	82.14	31.51
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	I	40.62	33.98	27.34	20.69	14.08	7.70	2.88
---------------------	---	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01	0.1	1	10	100	1000
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	0.01	0.1	1	10	100	1000
(F88T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	0.01	0.1	1	10	100	1000
(F88T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	18.00	184.00	184.04	184.40	188.00	224.00
(F88T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	36800.08	3680.08	368.08	36.88	3.76	.45
CONTRAST RATIOS							
CAS	1	460000.00	46000.00	4600.00	460.00	46.00	.46
CMAX	1	100.00	100.00	99.96	99.57	95.83	69.70
SHADES OF GRAY (SG)	1	38.62	31.98	25.34	18.70	12.11	5.97
							2.09

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	0.01	0.10	1.00	10.00	100.00	1000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.01	0.10	1.00	10.00	100.00	1000.00
(F80T-LAMBERTS)						
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	0.00	0.01	0.08	0.80	8.00	80.00
(F80T-LAMBERTS)						
NET DISPLAY LUMINANCE (BD)	184.00	184.01	184.08	184.80	192.00	264.00
(F80T-LAMBERTS)						
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	18400.08	1840.08	184.08	18.48	1.92	.26
						.10

CONTRAST RATIOS

CBS 1230000.00 23000.00 2300.00 230.00 23.00 2.30 .23

CMB 1 100.00 99.99 99.91 99.14 92.00 53.49 10.31

SHADES OF GRAY (SG) 1 36.62 29.98 23.34 16.70 10.17 4.44 1.60

IHM/S/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

158R TRANSMISSIVITY (VX) 13 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	(F80T-LAMBERTS)	.03	.31	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	(F80T-LAMBERTS)	.03	.00	.03	.32	3.25	32.50	325.00
NET DISPLAY LUMINANCE (BD)		150.00	150.00	150.03	150.32	153.25	182.50	475.00
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BA)		11538+.87	11538.71	1154.10	115.63	11.79	1.40	.37

CONTRAST RATIOS

CAS	1461538+.46	46153.85	4615.38	461.54	46.15	4.62	.46
C MAX	100.00	100.00	99.96	99.57	95.85	69.77	18.75

SHADES OF GRAY (S03)	38.63	31.99	25.35	18.71	12.12	5.98	2.09
----------------------	-------	-------	-------	-------	-------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.06	.62	6.25	62.50	625.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.02	.06	.62	6.25	62.50	625.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.02	.06	.62	6.25	62.50	625.00
NET DISPLAY LUMINANCE (BD)	150.00	150.01	150.06	150.62	156.25	212.50	775.00
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BR)	6000.25	6000.25	600.25	60.25	6.25	.85	.31

CONTRAST RATIOS

CBS	120000.00	24000.00	2400.00	240.00	24.00	2.40	.24
-----	-----------	----------	---------	--------	-------	------	-----

MAX

100.00	99.99	99.92	99.17	92.31	54.55	10.71
--------	-------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)

36.75	30.10	23.46	16.83	10.29	4.53	1.62
-------	-------	-------	-------	-------	------	------

JM540 DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (RX) 25 PER CENT

GLASS TRANSMISSIVITY (VX) 50 PER CENT

BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	.00	.05	.50	5.00	50.00	500.00	5000.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.01	.12	1.25	12.50	125.00	1250.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	150.00	150.01	150.12	151.25	162.50	275.00	1400.00
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	3000.25	3000.25	300.25	30.25	3.25	.55	.28

CONTRAST RATIOS

CABS 1120000.00 12000.00 1200.00 120.00 12.00 1.20 .12

CMAX 1 100.00 93.94 99.83 98.36 85.71 37.50 5.66

SHADES OF GRAY (SG) 1 34.75 23.10 21.46 14.84 8.40 3.28 1.33

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FOOT-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	60000.00	6000.00	600.00	60.00	6.00	.60	.26
-----	---	----------	---------	--------	-------	------	-----	-----

CHAX	1	100.00	99.97	99.67	96.77	75.00	23.18	2.91
------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	1	32.75	26.10	19.46	12.86	6.61	2.36	1.17
---------------------	---	-------	-------	-------	-------	------	------	------

IHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

BACKGROUND LUMINANCE (LB)	I	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.00	.01	.13	1.30	13.00	130.00	1300.00
(F80T-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BS)	I	.00	.01	.06	.65	6.50	65.00	650.00
(F80T-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	100.00	100.01	100.06	100.65	106.50	165.00	750.00
(F80T-LAMBERTS)	I							
INTER-SCALAR LUMINANCE DIFFERENCE RATIO (BR)	I	76923.58	7692.81	769.73	77.42	8.19	1.27	.56

CONTRAST RATIOS

CBS I 1538.6.15 15384.62 1538.46 153.85 15.38 1.54 .15

CMB I 100.00 99.99 99.87 98.72 88.50 43.48 7.14

SHADES OF GRAY (SG) I 35.46 28.82 22.18 15.55 9.07 3.69 1.41

JHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX)

50 PER CENT

VISOR TRANSMISSIVITY (VX)

20 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	80000.00	8000.00	800.00	80.00	8.00	.80	.08
CMAX	1	100.00	99.98	99.75	97.56	80.00	28.57	3.85
SHADES OF GRAY (SG)	1	33.58	26.93	20.29	13.68	7.34	2.70	1.22

INHS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

BACKGROUND LUMINANCE (LB)	I	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	.00	.05	.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.02	.25	2.50	25.00	250.00	2500.00
NET DISPLAY LUMINANCE (BD)	I	100.00	100.02	100.25	102.50	125.00	350.00	2600.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	20000.50	2000.50	200.50	20.50	2.50	.70	.52

CONTRAST RATIOS

CABS	I	40000.00	4000.00	400.00	40.00	4.00	.40	.04
CMAX	I	100.00	99.95	99.50	95.24	66.67	16.67	1.96

SHADES OF GRAY (SGG)	I	31.58	24.93	18.29	11.72	5.64	1.97	1.11
----------------------	---	-------	-------	-------	-------	------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1 20000.00 2000.00 200.00 20.00 2.00 .20 .02

CMB 1 99.99 99.99 99.99 99.99 99.99 99.99 99.99

SHADES OF GRAY (SG) 1 29.58 22.93 16.30 9.78 4.17 1.53 1.06

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (RX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.00	0.01	0.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(HV)	I							
(FOOT-LAMBERTS)	I							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB)	I	0.00	0.01	0.10	0.97	9.75	97.50	975.00
(FOOT-LAMBERTS)	I							
NET DISPLAY LUMINANCE (BD)	I	50.00	50.01	50.10	50.97	59.75	147.50	1025.00
(FOOT-LAMBERTS)	I							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	38462.29	3846.90	385.37	39.21	4.60	1.13	.79

CONTRAST RATIOS

CABS	I	51282.05	5128.21	512.82	51.28	5.13	.51	.05
------	---	----------	---------	--------	-------	------	-----	-----

CHAX	I	100.00	99.96	99.61	96.25	71.94	20.41	2.50
------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SOG)	I	32.29	25.65	19.01	12.42	6.23	2.19	1.14
----------------------	---	-------	-------	-------	-------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.02	.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	.00	.02	.19	1.87	18.75	187.50	1875.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.02	.19	1.87	18.75	187.50	1875.00
NET DISPLAY LUMINANCE (BD)	50.00	50.02	50.19	51.87	68.75	237.50	1925.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	20000.75	2000.75	200.75	20.75	2.75	.95	.77

CONTRAST RATIOS

CBS	26666.67	2666.67	266.67	26.67	2.67	.27	.03
-----	----------	---------	--------	-------	------	-----	-----

CMAX	99.99	99.93	99.26	93.02	57.14	11.76	1.32
------	-------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	30.41	23.76	17.13	10.58	4.75	1.68	1.08
---------------------	-------	-------	-------	-------	------	------	------

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 200 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.01	0.05	0.37	3.75	37.50	375.00	3750.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	0.01	0.05	0.37	3.75	37.50	375.00	3750.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	0.01	0.05	0.37	3.75	37.50	375.00	3750.00
NET DISPLAY LUMINANCE (BD)	I	50.00	50.04	50.37	53.75	87.50	425.00	3800.00
INIER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	10000.75	1000.75	100.75	10.75	1.75	.85	.76

CONTRAST RATIOS

CBS	I	1333.33	133.33	13.33	1.33	.13	.01
-----	---	---------	--------	-------	------	-----	-----

CMB	I	99.99	99.85	98.52	86.96	40.00	6.25	.66
-----	---	-------	-------	-------	-------	-------	------	-----

SHADES OF GRAY (SGG)	I	28.41	21.76	15.14	8.68	3.44	1.36	1.04
----------------------	---	-------	-------	-------	------	------	------	------

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

200 F90T-LAMBERTS		75 PER CENT		100 PER CENT	
DISPLAY LUMINANCE (LD)	BEAM SPLITTER TRANSMISSIVITY (BX)	VISOR TRANSMISSIVITY (VX)			
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L 1000FT-L 10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.01	0.10	1.00	10.00	100.00 1000.00 10000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.01	0.07	0.75	7.50	75.00 750.00 7500.00
NET DISPLAY LUMINANCE (BD)	50.01	50.07	50.75	57.50	125.00 800.00 7550.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	5000.75	500.75	50.75	5.75	1.25 .80 .75
CONTRAST RATIOS					
CARS	6666.67	666.67	66.67	6.67	.67 .07 .01
CHAX	99.97	99.70	97.09	76.92	25.00 3.23 .33
SHADES OF GRAY (S8G)	26.41	19.77	13.16	6.88	2.47 1.19 1.02

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1076923.08507692	31150769.23	15076.92	1507.69	150.77	15.08	
-----	------------------	-------------	----------	---------	--------	-------	--

CMB	1	100.00	100.00	100.00	99.99	99.87	98.69
-----	---	--------	--------	--------	-------	-------	-------

SHADES OF GRAY (SG)	1	48.63	42.05	35.40	28.76	22.12	15.49
---------------------	---	-------	-------	-------	-------	-------	-------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	0.01	0.02	0.05	0.50	5.00	50.00	500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	0.01	0.02	0.05	0.50	5.00	50.00	500.00
(F80T-LAMBERTS)								
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	0.01	0.02	0.05	0.50	5.00	50.00	500.00
(F80T-LAMBERTS)								
NET DISPLAY LUMINANCE (BD)	I	392.00	392.00	392.00	392.05	392.50	397.00	442.00
(F80T-LAMBERTS)								
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	156800.02	15680.02	1568.02	156.82	15.68	1.568	0.1568

CONTRAST RATIOS

CBS	I	1840000.00	184000.00	18400.00	1840.00	184.00	18.40	1.84
CMAX	I	100.00	100.00	100.00	99.97	99.75	97.51	79.67

SHADES OF GRAY (S8G)	I	46.80	40.16	33.52	26.87	20.23	13.62	7.29
----------------------	---	-------	-------	-------	-------	-------	-------	------

INMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1920000	3920000	3920000	3920000	3920000	3920000	3920000
CMB	1	1	1	1	1	1	1
SHADES OF GRAY (SG)	1	1	1	1	1	1	1

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 2 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (B3)	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (B4)	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1960000.00196000.00 19600.00 1960.00 196.00 19.60 1.96

CMAK 1 100.00 100.00 99.99 99.90 98.99 90.74 49.49

SHADES OF GRAY (SGG) 1 42.80 36.16 29.52 22.87 16.24 9.73 4.13

JHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BX)	.00	.01	.13	1.30	13.00	130.00	1300.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	.00	.00	.01	.05	.52	5.20	52.00
NET DISPLAY LUMINANCE (BD)	384.00	384.00	384.01	384.05	384.52	389.20	436.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	129538.66	29538.50	2953.89	295.42	29.58	2.99	.34

CONTRAST RATIOS

CBS 1384615.38738461.54 73846.18 7384.62 738.46 73.85 7.38

CMAX 1 100.00 100.00 100.00 99.97 99.73 97.36 78.69

SHADES OF GRAY (SGG) 1 46.63 39.99 33.34 26.70 20.06 13.45 7.14

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	.00	.02	.25	2.50	25.00	250.00
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.00	.01	.10	1.00	10.00
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	384.00	384.00	384.01	384.10	385.00	394.00
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	153600.04	15360.04	1536.04	153.64	15.40	1.54

CONTRAST RATIOS

CBS	1	1840000.00	384000.00	38400.00	3840.00	384.00	38.40
CMB	1	100.00	100.00	99.99	99.95	99.44	95.05
SHADES OF GRAY (SG)	1	44.75	38.10	31.46	24.81	18.14	11.60

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	.05	.50	5.00	50.00	500.00	5000.00	
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (RV)	1	.00	.02	.20	2.00	20.00	200.00	
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.02	.20	2.00	20.00	200.00	
NET DISPLAY LUMINANCE (BD)	1	384.00	384.02	384.20	386.00	404.00	584.00	
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	7680.04	768.04	76.84	7.72	.81	.12	

CONTRAST RATIOS

CABS 1920000.00192000.00 19200.00 1920.00 192.00 19.20 1.92

CMAX 1 100.00 100.00 99.99 99.90 98.97 90.57 48.98

SHADES OF GRAY (SG) 1 42.75 36.10 29.46 22.82 16.18 9.67 4.09

IMMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F98T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 4 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(F98T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F98T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F98T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
	384.00	384.00	384.00	384.00	384.00	384.00	384.00

CONTRAST RATIOS

CBS 1960000.00 96000.00 9600.00 960.00 96.00 9.60 .96

CHAX 1 100.00 100.00 99.98 99.79 97.96 82.76 32.43

SHADES OF GRAY (SG) 1 40.75 34.10 27.46 20.82 14.20 7.81 2.94

IMSD DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 8 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (RV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1538461.54353846.15 35384.62 3538.46 353.85 35.38 3.54

CMAX 1 100.00 100.00 99.99 99.94 99.44 94.65 63.82

SHADES OF GRAY (SG) 1 44.51 37.87 31.22 24.58 17.94 11.37 5.36

IMHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 3 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.00	.02	.25	2.50	25.00	250.00	2500.00
(F80T-LAMBERTS)	1							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.00	.02	.20	2.00	20.00	200.00
(F80T-LAMBERTS)	1							
NET DISPLAY LUMINANCE (BD)	1	368.00	368.00	368.02	368.20	370.00	386.00	568.00
(F80T-LAMBERTS)	1							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	147200.08	14720.08	1472.08	147.28	14.80	1.55	.23

CONTRAST RATIOS

CAS	1840000.00	184000.00	18400.00	1840.00	184.00	18.40	1.84	
-----	------------	-----------	----------	---------	--------	-------	------	--

CHAX	1	100.00	100.00	99.99	99.89	98.92	90.20	47.92
------	---	--------	--------	-------	-------	-------	-------	-------

SHADES OF GRAY (SG)	1	42.62	35.98	29.33	22.69	16.06	9.56	4.01
---------------------	---	-------	-------	-------	-------	-------	------	------

IHMS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

	400 FOOT-LAMBERTS	8 PER CENT	50 PER CENT	
DISPLAY LUMINANCE (LD)				
BKGM SPLITTER TRANSMISSIVITY (BX)				
VISOR TRANSMISSIVITY (VX)				
BACKGROUND LUMINANCE (LB) I	0.01FT-L	0.1FT-L	1FT-L	10FT-L 100FT-L 1000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER(HV) (FOOT-LAMBERTS)	I .00	.05	.50	5.00 50.00 500.00 5000.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER(BB) (FOOT-LAMBERTS)	I .00	.00	.04	.40 4.00 40.00 400.00
NET DISPLAY LUMINANCE (BD) I	368.00	368.00	368.04	368.40 372.00 408.00 768.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	73600.06	7360.08	736.08	73.68 7.44 .82 .15
CONTRAST RATIOS				
CBS I	1920000.00	92000.00	9200.00	920.00 92.00 9.20 .92
CMAX I	100.00	100.00	99.98	99.78 97.87 82.14 31.51
SHADES OF GRAY (SGG) I	40.62	33.93	27.34	20.69 14.08 7.70 2.86

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD)	400 FOOT-LAMBERTS	5 PER CENT	100 PER CENT
BEAM SPLITTER TRANSMISSIVITY (BX)			
VISOR TRANSMISSIVITY (VX)			
BACKGROUND LUMINANCE (LB)	0.01FT-L	0.1FT-L	1FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	0.01	0.10	1.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	0.00	0.01	0.08
NET DISPLAY LUMINANCE (BD)	368.00	368.01	368.08
INTER-Ocular LUMINANCE DIFFERENCE RATIO (BA)	36800.00	3680.08	368.08
CONTRAST RATIOS			
CAS	1460000.00	46000.00	4600.00
CMA	100.00	100.00	99.96
SHADES OF GRAY (SG)	38.62	31.98	25.34

IHWS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISBR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	I	I	I	I	I	I	I
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	I	.01	.13	1.30	13.00	130.00	1300.00
(FOOT-LAMBERTS)	I						
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	I	.00	.03	.32	3.25	32.50	325.00
(FOOT-LAMBERTS)	I						
NET DISPLAY LUMINANCE (BD)	I	300.00	300.00	300.32	303.25	332.50	625.00
(FOOT-LAMBERTS)	I						
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	I	1230769.48	23077.17	2307.94	231.02	23.33	2.56
.48							

CONTRAST RATIOS

CBS 1923076.92 92307.69 9230.77 923.08 92.31 9.23 .92

C MAX I 100.00 100.00 99.98 99.78 97.88 82.19 31.58

SHADES OF GRAY (SBB) I 40.63 33.99 27.34 20.70 14.09 7.71 2.89

INHS/C DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB) I	0.00	0.02	0.25	2.50	25.00	250.00	2500.00
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV) I	0.00	0.01	0.06	0.62	6.25	62.50	625.00
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB) I	0.00	0.01	0.06	0.62	6.25	62.50	625.00
NET DISPLAY LUMINANCE (BD) I	300.00	300.01	300.06	300.62	306.25	362.50	975.00
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA) I	112000.25	12000.25	1200.25	120.25	12.25	1.45	.37

CONTRAST RATIOS

CABS I	1480000.00	48000.00	4800.00	480.00	48.00	4.80	.48
CHAX I	100.00	100.00	99.96	99.59	96.00	70.59	19.35

SHADES OF GRAY (SG) I	38.75	32.10	25.46	18.82	12.23	6.07	2.13
-----------------------	-------	-------	-------	-------	-------	------	------

JHWS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1243000.00 24000.00 2400.00 240.00 24.00 2.40 .24

CHAX 1 100.00 99.99 99.92 99.17 92.31 54.55 10.71

SHADES OF GRAY (SG) 1 36.75 30.10 23.46 16.83 10.29 4.53 1.62

INHS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F89T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 25 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	120000.00	12000.00	1200.00	120.00	12.00	1.20	.12
-----	-----------	----------	---------	--------	-------	------	-----

CHAX	100.00	99.98	99.83	98.36	85.71	37.50	5.66
------	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SG)	34.75	28.10	21.46	14.84	8.40	3.28	1.33
---------------------	-------	-------	-------	-------	------	------	------

INMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTRA-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1
CONTRAST RATIOS							
CBS	1307692.31	30769.23	3076.92	307.69	30.77	3.08	.31

	100.00	99.99	99.94	99.35	93.90	60.61	13.33
SHADES OF GRAY (SG)	1	1	1	1	1	1	1
CONTRAST RATIOS							
CBS	37.46	30.82	24.18	17.54	10.98	5.05	1.77

IHW'S/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F99T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BR)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS 1160000.00 16000.00 1600.00 160.00 16.00 1.60 .16

CMAX 1 100.00 99.99 99.88 98.77 88.89 44.44 7.41

SHADES OF GRAY (SG) 1 35.58 28.93 22.29 15.66 9.17 3.76 1.43

INPS/O DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F99T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 50 PER CENT

VISR TRANSMISSIVITY (VX) 50 PER CENT

		0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE (LB)	I	0.00	0.05	0.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	I	0.00	0.05	0.50	5.00	50.00	500.00	5000.00
NET BACKGROUND LUMINANCE WITH IN BEAM SPLITTER (BS)	I	0.00	0.02	0.25	2.50	25.00	250.00	2500.00
NET DISPLAY LUMINANCE (BD)	I	200.00	200.02	200.25	202.50	225.00	450.00	2700.00
INTER-OCCULAR LUMINANCE DIFFERENCE RATIO (RA)	I	40000.50	4000.50	400.50	40.50	4.50	.90	.54

CONTRAST RATIOS

CAS	I	80000.00	8000.00	800.00	80.00	8.00	.80	.08
-----	---	----------	---------	--------	-------	------	-----	-----

CHAX I I

SHADES OF GRAY (SG)	I	33.58	26.93	20.29	13.68	7.34	2.70	1.22
---------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 FOOT-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 13 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAM SPLITTER (BV)	1	1	1	1	1	1	1
(FBST-LAMBERTS)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (B8)	1	1	1	1	1	1	1
(FBST-LAMBERTS)	1	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(FBST-LAMBERTS)	1	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (B8)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	102564.10	10256.41	1025.64	102.56	10.26	1.03	.10
-----	-----------	----------	---------	--------	-------	------	-----

CHAX	100.00	99.98	99.81	98.09	83.68	33.90	4.88
------	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SGG)	34.29	27.65	21.01	14.39	7.99	3.04	1.28
----------------------	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F00T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 25 PER CENT

BACKGROUND LUMINANCE (LB)	1	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	.00	.02	.25	2.50	25.00	250.00	2500.00
(F00T-LAMBERTS)	1							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	.00	.02	.19	1.87	18.75	187.50	1875.00
(F00T-LAMBERTS)	1							
NET DISPLAY LUMINANCE (BD)	1	100.00	100.02	100.19	101.87	118.75	287.50	1975.00
(F00T-LAMBERTS)	1							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	40000.75	4000.75	400.75	40.75	4.75	1.15	.79

CONTRAST RATIOS

CABS	1	53333.33	5333.33	533.33	53.33	5.33	.53	.05
------	---	----------	---------	--------	-------	------	-----	-----

CMAX	1	100.00	99.96	99.63	96.39	72.73	21.05	2.60
------	---	--------	-------	-------	-------	-------	-------	------

SHADES OF GRAY (SOG)	1	32.41	25.76	19.42	12.53	6.33	2.23	1.15
----------------------	---	-------	-------	-------	-------	------	------	------

IHMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F80T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (BX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 50 PER CENT

	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L	10000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (B3)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1	1
(F80T-LAMBERTS)							
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (BA)	1	1	1	1	1	1	1

CONTRAST RATIOS

CBS	1	2666.67	266.67	26.67	2.67	.27	.03
CMAX	1	99.99	9.99	9.99	9.99	9.99	9.99
SHADES OF GRAY (SG)	1	30.41	23.76	17.13	13.58	10.75	1.04

THMS/D DISPLAY LUMINANCE AND CONTRAST RESEARCH

DISPLAY LUMINANCE (LD) 400 F90T-LAMBERTS

BEAM SPLITTER TRANSMISSIVITY (HX) 75 PER CENT

VISOR TRANSMISSIVITY (VX) 100 PER CENT

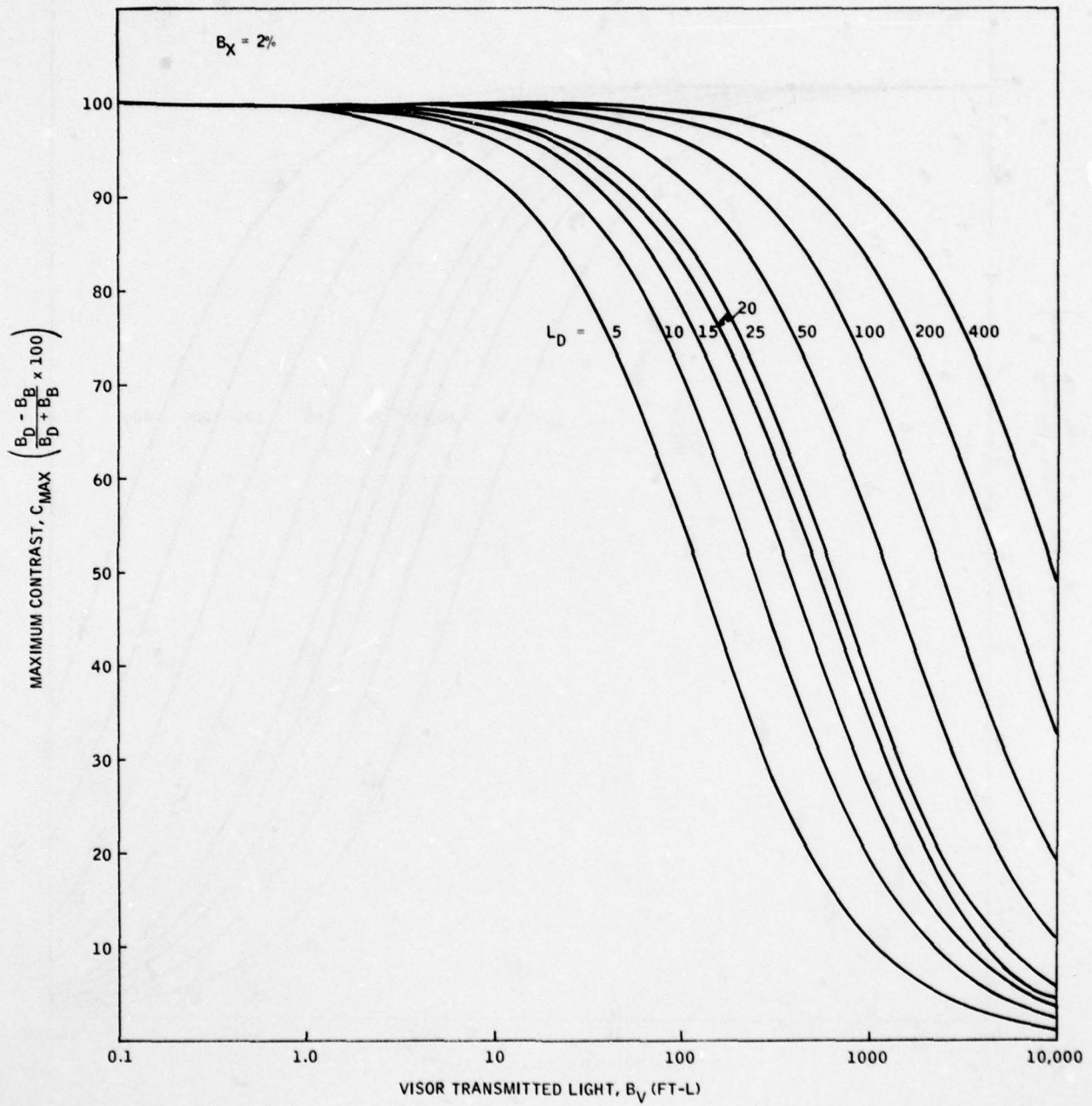
	0.01FT-L	0.1FT-L	1FT-L	10FT-L	100FT-L	1000FT-L
BACKGROUND LUMINANCE (LB)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE OUTSIDE BEAMSPLITTER (BV)	1	1	1	1	1	1
NET BACKGROUND LUMINANCE WITHIN BEAM SPLITTER (BB)	1	1	1	1	1	1
NET DISPLAY LUMINANCE (BD)	1	1	1	1	1	1
INTER-OCULAR LUMINANCE DIFFERENCE RATIO (RA)	1	1	1	1	1	1
CONTRAST RATIOS						
CAS	13333.33	1333.33	133.33	13.33	1.33	0.1

CMA	99.99	99.95	98.52	86.36	40.00	6.25
SHADES OF GRAY (SG)	28.41	21.76	15.14	8.68	3.44	1.36

APPENDIX B

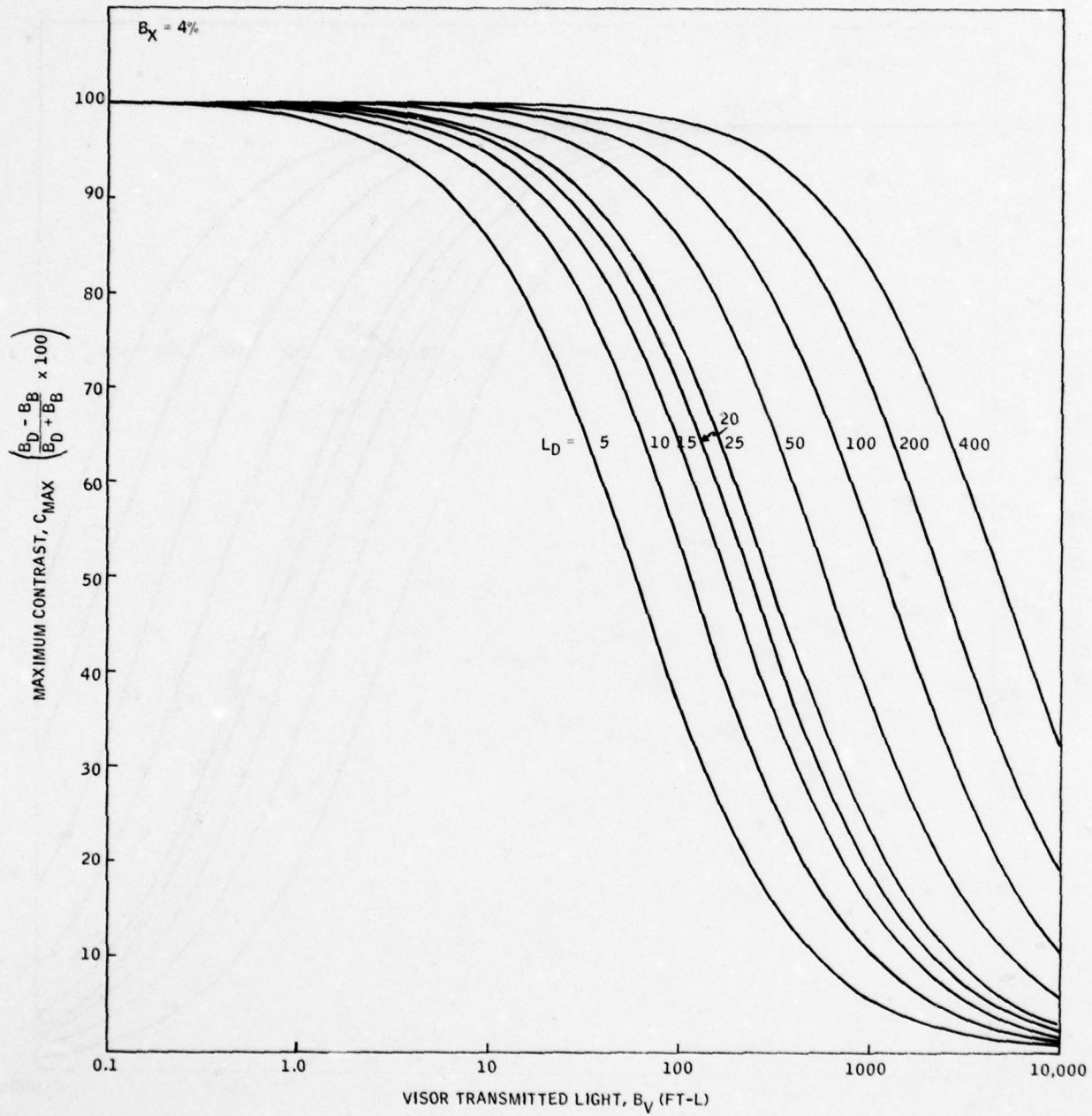
MAXIMUM POSSIBLE CONTRAST (C_{MAX}) AS A
FUNCTION OF VISOR TRANSMITTED LIGHT (B_V)
FOR VARIOUS VALUES OF DISPLAY LUMINANCE
(L_D). BEAMSPLITTER TRANSMITTANCE (B_X) =
CONSTANT FOR EACH PAGE.

- B1 -



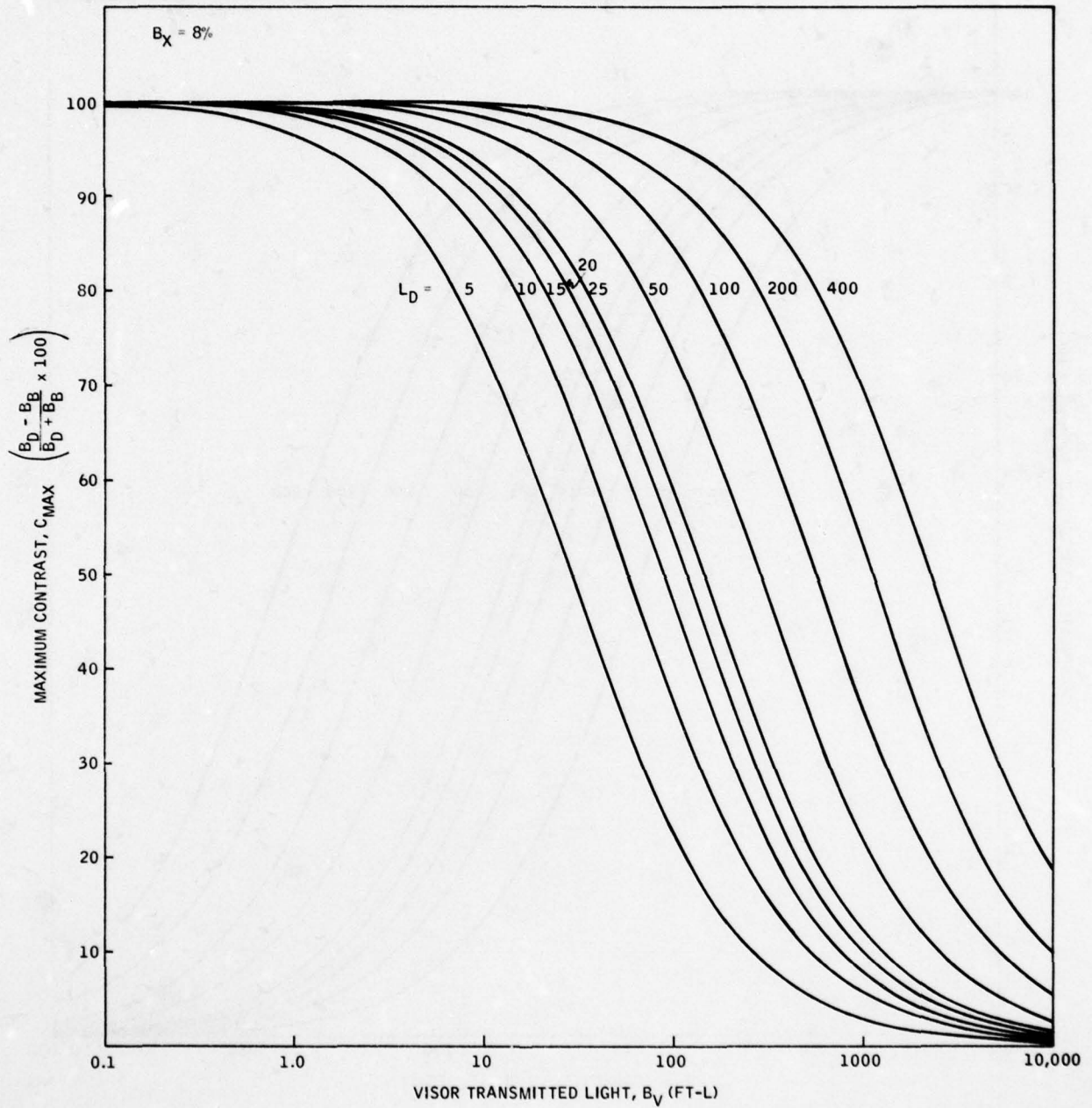
2079-SR5

- B2 -

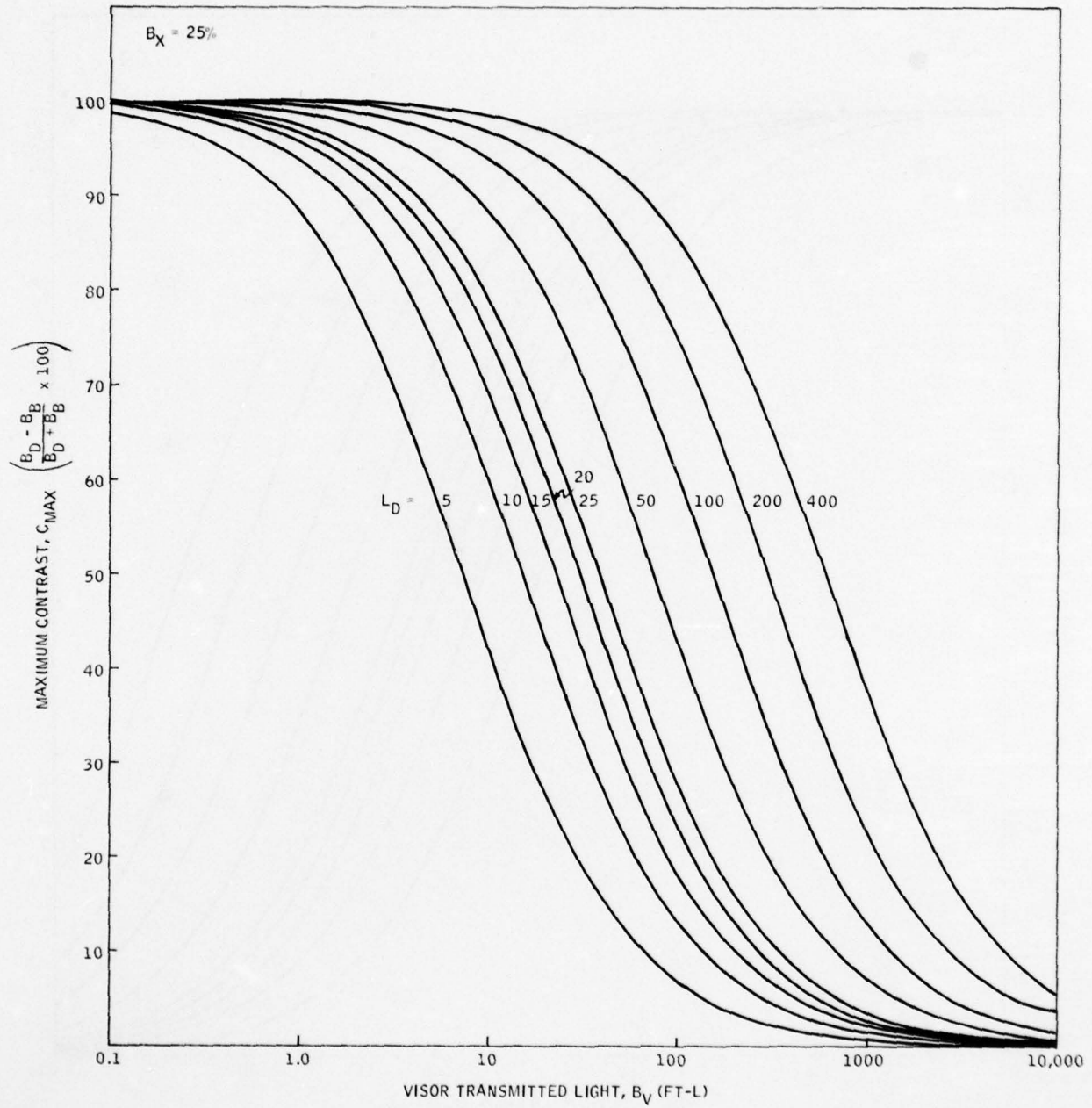


2079-SR5

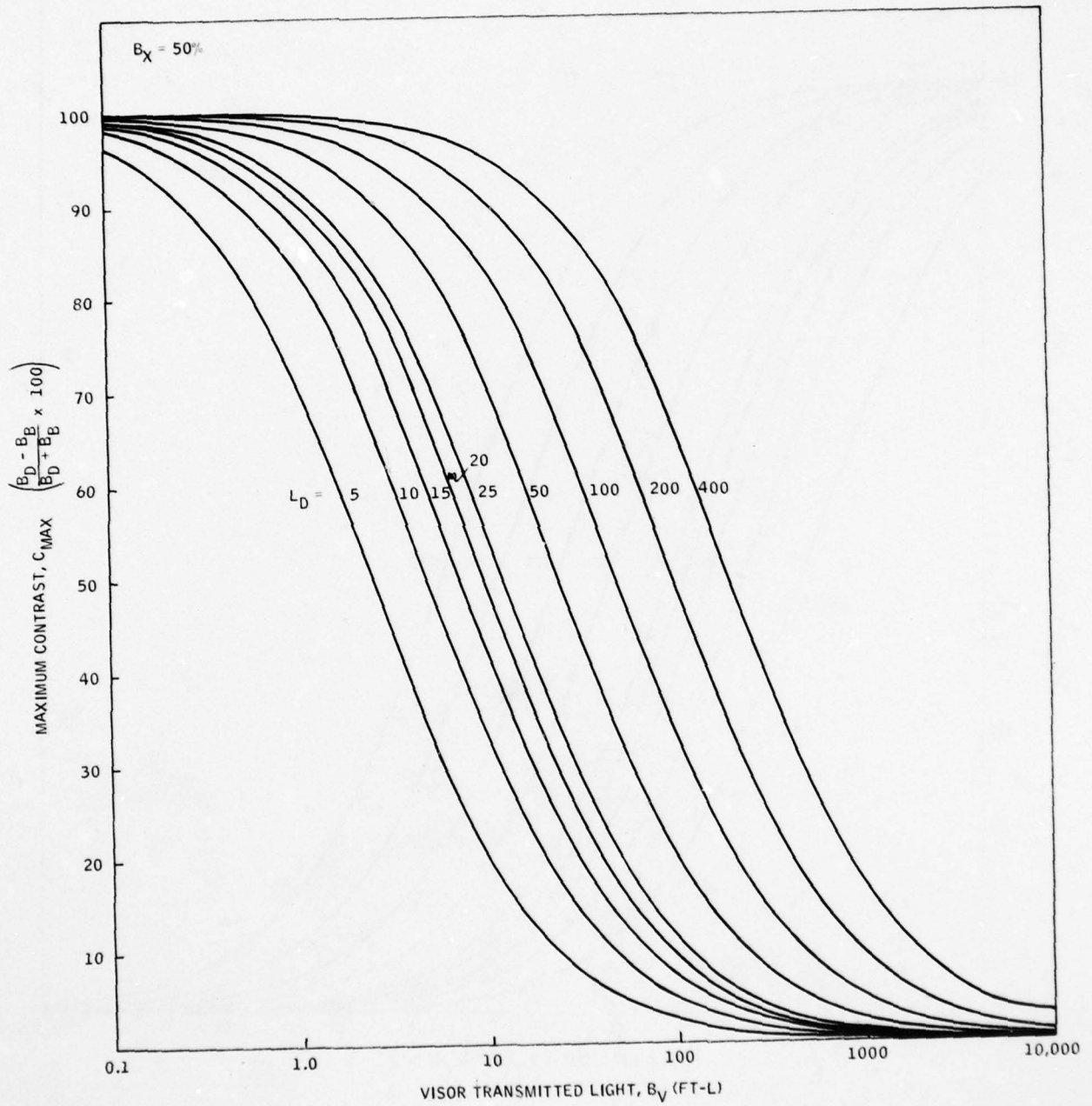
- B3 -



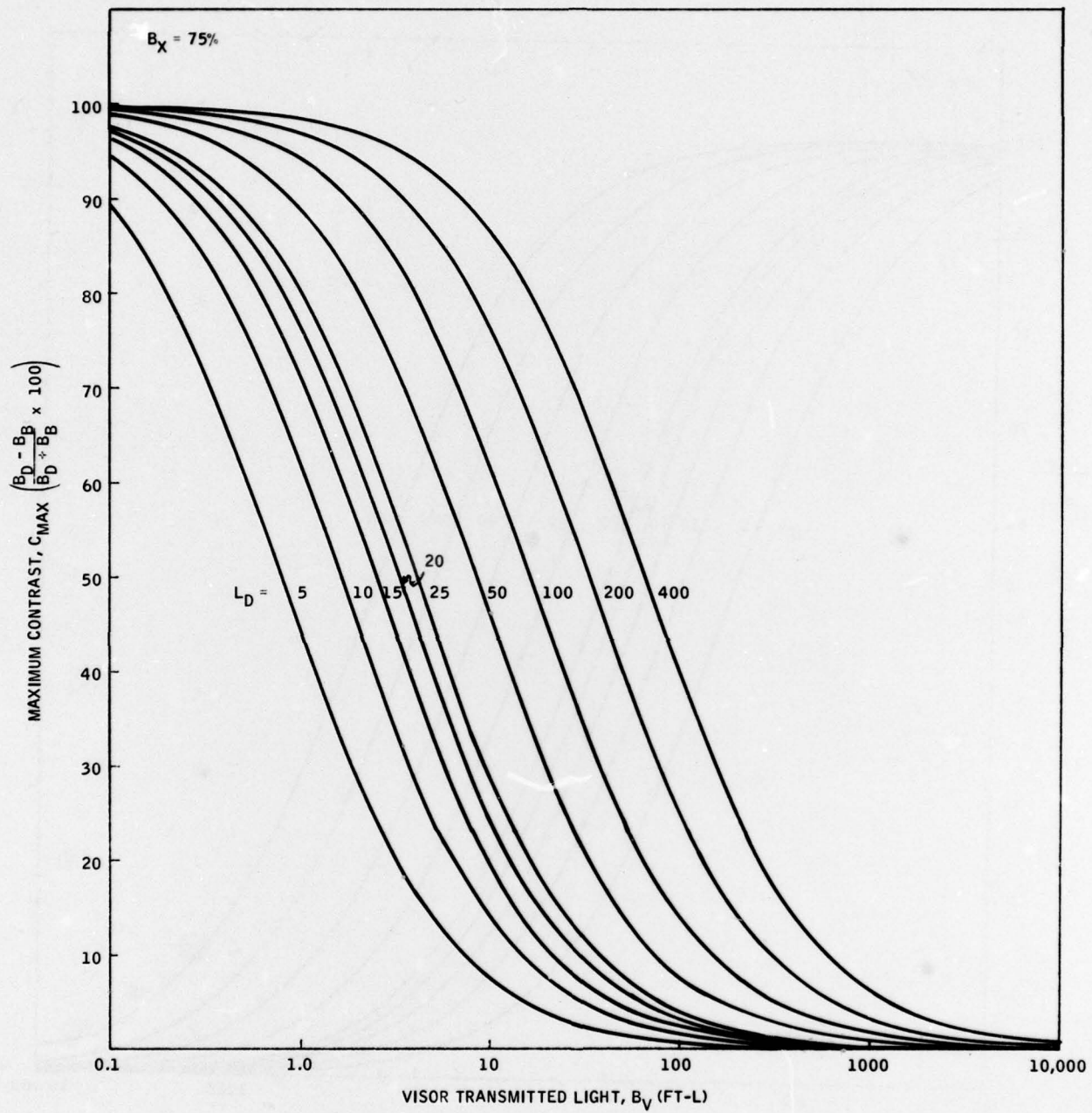
2079-SR5



- B5 -



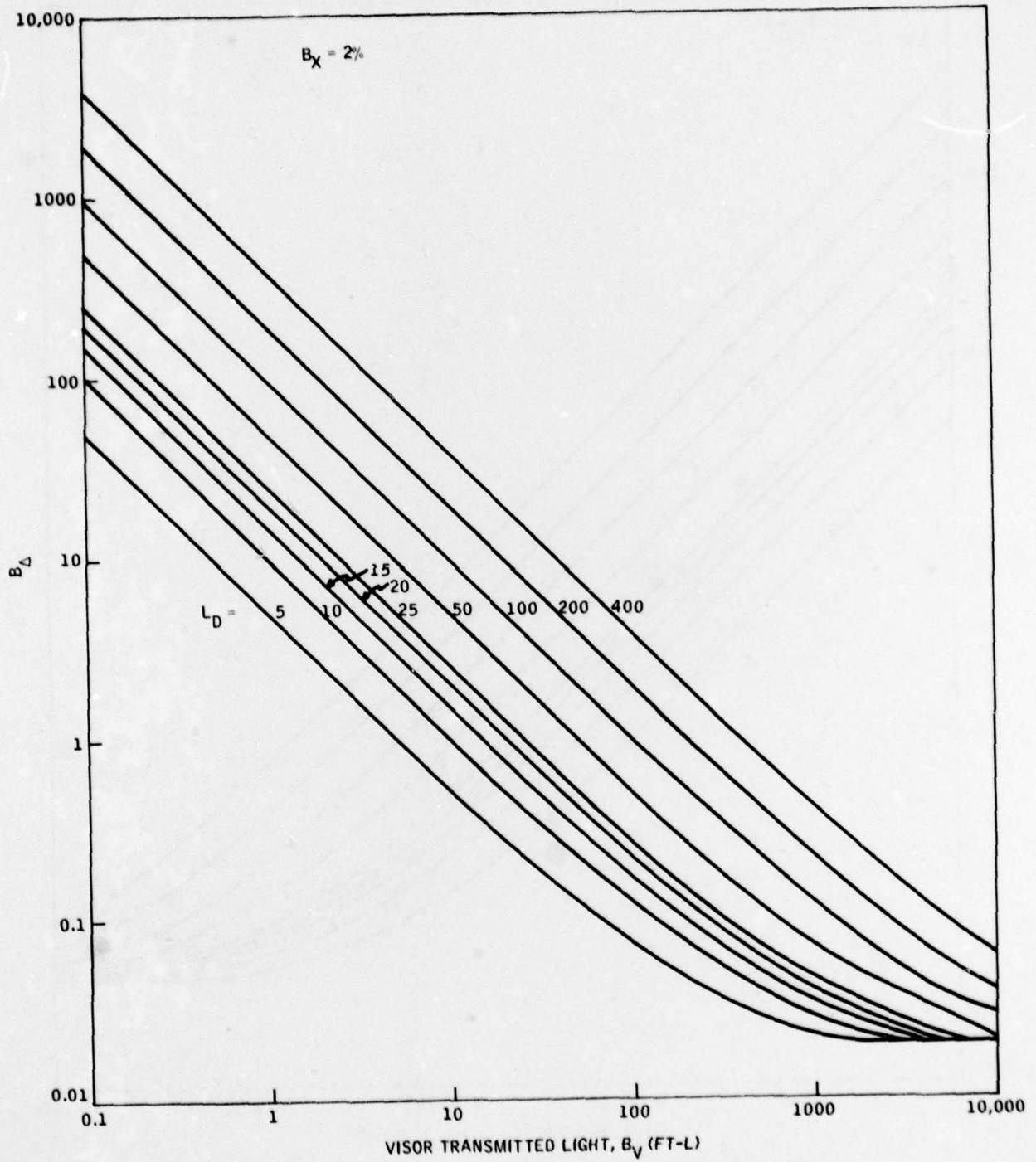
2079-SR5



APPENDIX C

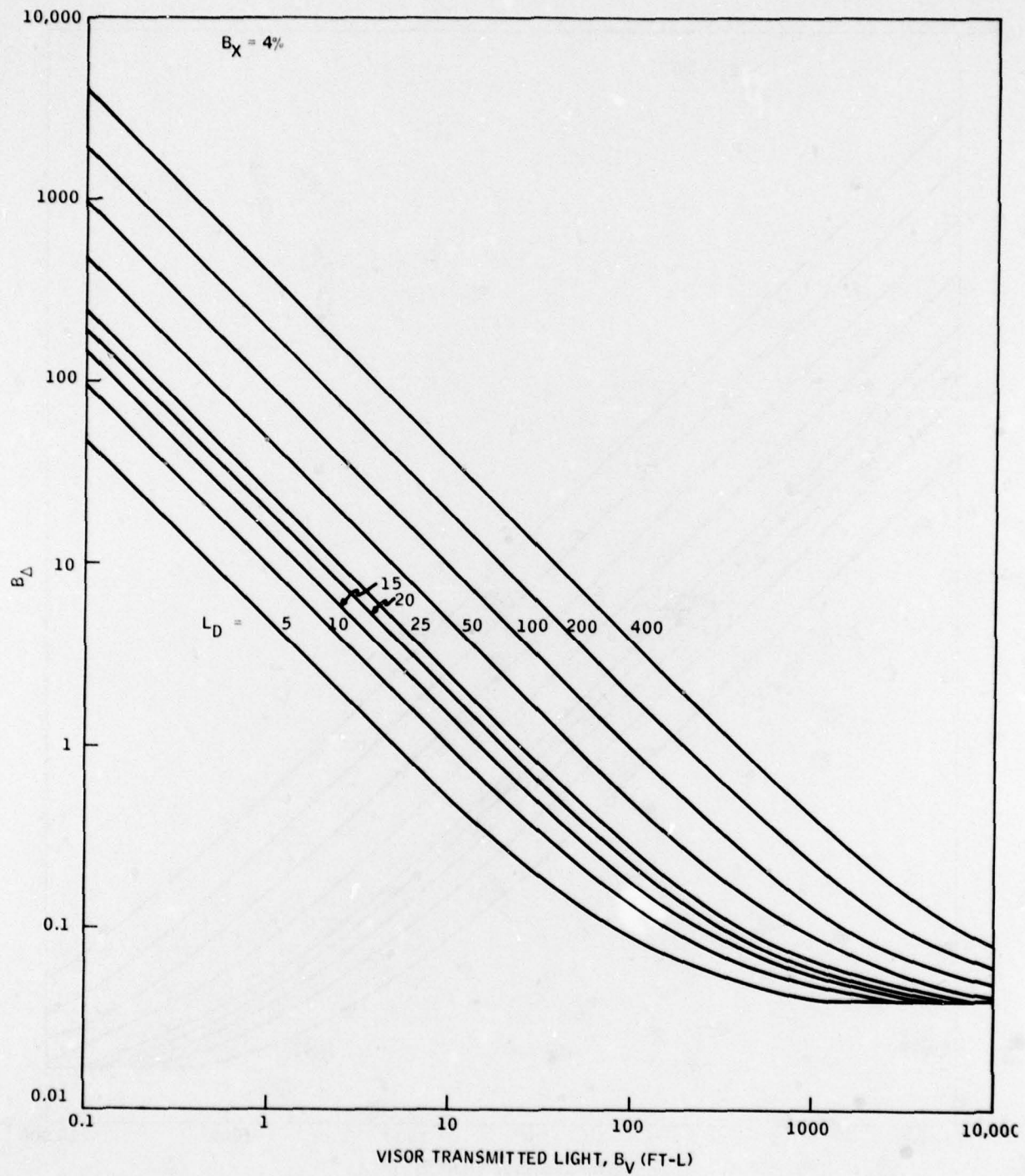
INTER-OCULAR LUMINANCE DIFFERENCE RATIO
(B_{Δ}) AS A FUNCTION OF VISOR TRANSMITTED LIGHT
(B_V) FOR VARIOUS VALUES OF DISPLAY LUMINANCE
(L_D). BEAMSPLITTER TRANSMITTANCE (B_X) =
CONSTANT FOR EACH PAGE.

- C1 -



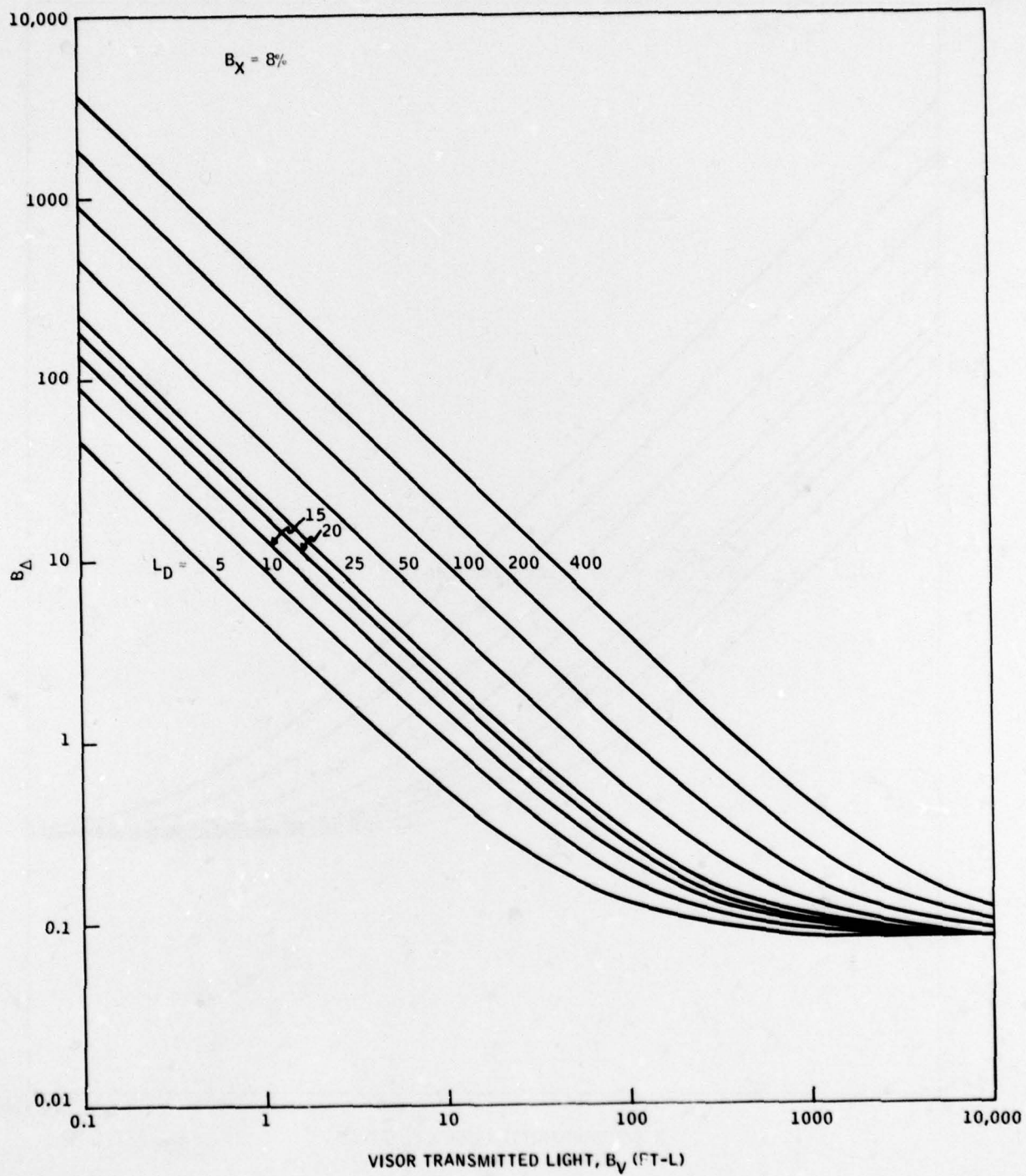
2079-SR5

- C2 -

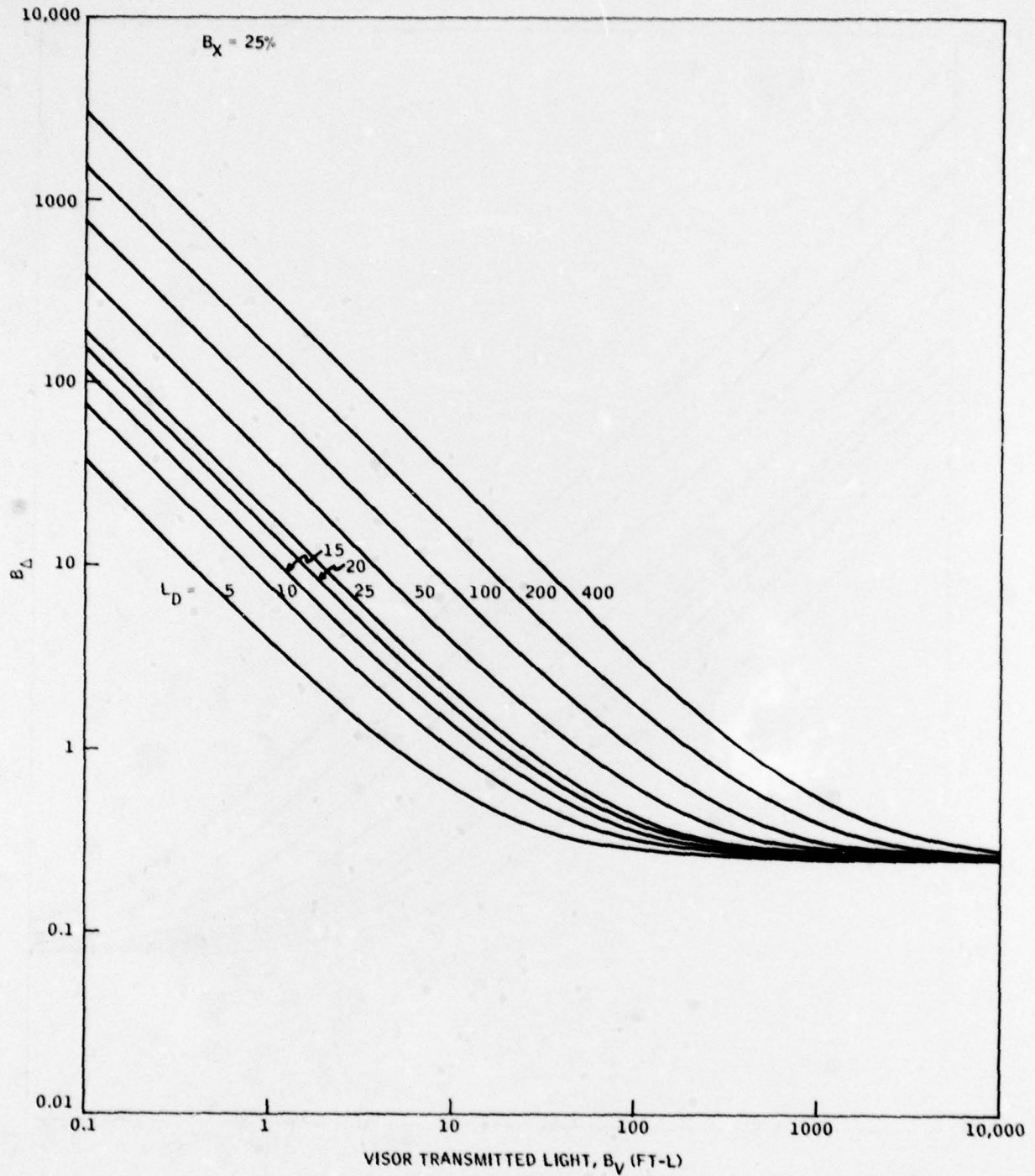


2079-SR5

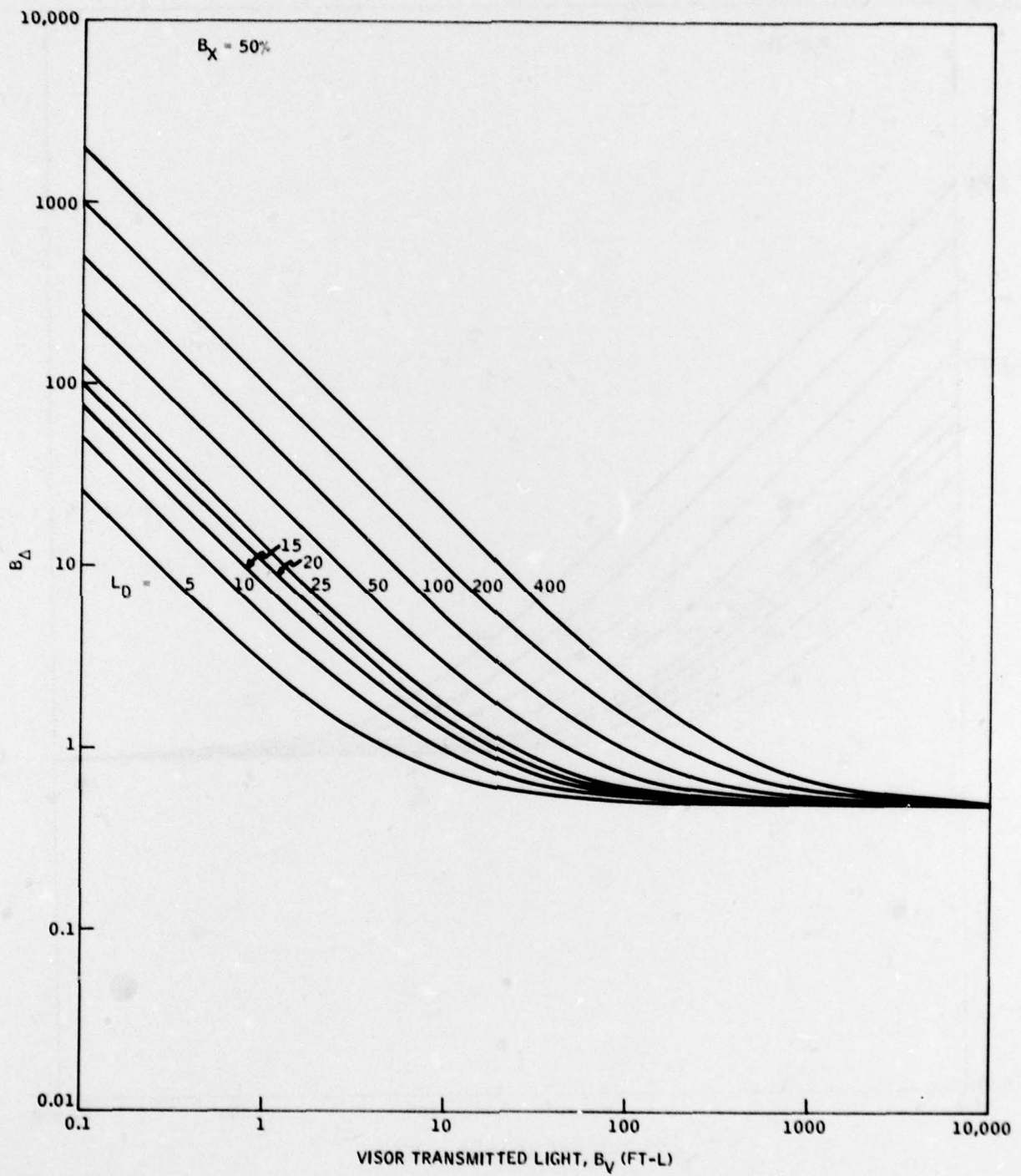
- C3 -



2079-SR5

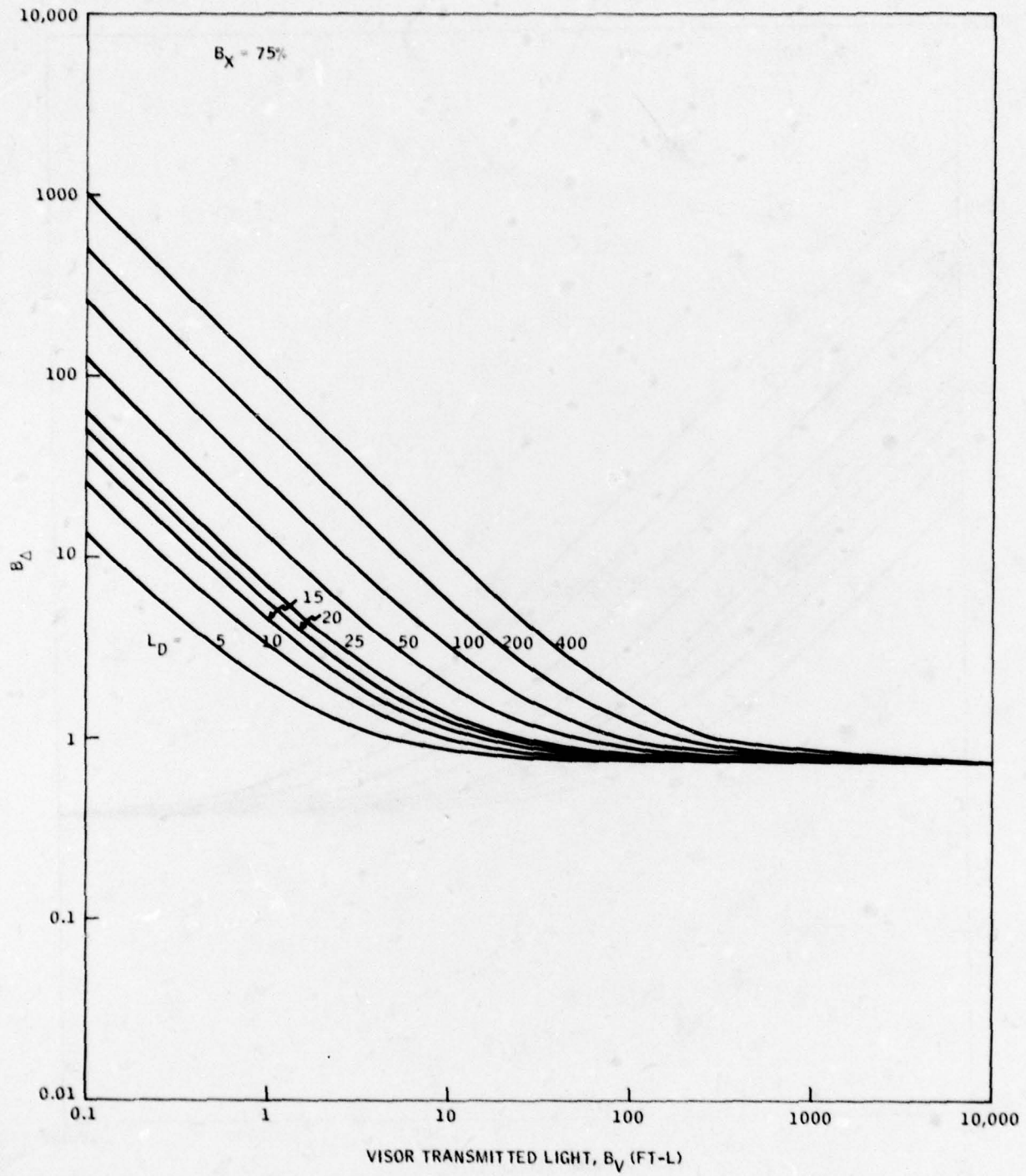


- C5 -



2079-SR5

- C6 -



2079-SR5